Vol. 97, No. 9 SEPTEMBER, 1950

WATER & SEWAGE WORKS

WATER SUPPLY SEWAGE DISPOSAL

INDUSTRIAL WASTE TREATMENT

IN ISRAEL—"WATER IS WHERE YOU FIND IT."

Reduce

INSTALLATION PROBLEMS

NO MATCH-MARKING IN THE FIELD

WITH **CHAPMAN** *Standardized* **SLUICE GATES**

You'll save lots of installation time with these Chapman *standardized* sluice gates. Each one is designed with interchangeable stems and couplings so that match-marking in the field is unnecessary.

What's more, Chapman Sluice Gates may be obtained with any type of operating control—manual, hydraulic cylinder, or motor unit. For additional information send for your copy of Chapman's Sluice Gate Handbook.

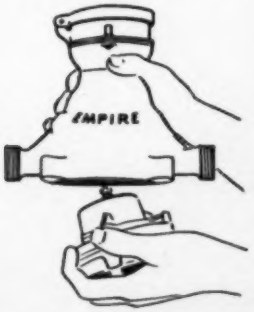
THE CHAPMAN VALVE MFG. CO.

INDIAN ORCHARD, MASSACHUSETTS

WATER AND SEWAGE WORKS. Reg. U. S. Patent Off. September, 1950. Volume 97. Number 9. Published monthly by Gillette Publishing Co., at 404 North Wesley Ave., Mount Morris, Ill. Per copy, 25¢; Subscription rate: United States, $2.00 per year; Canada, $2.00 per year; Foreign, $3.00 per year. Entered as second class matter March 4, 1948, at the post office at Mount Morris, Illinois, under Act of March 3, 1879. Executive and business offices, 22 W. Maple St., Chicago 10, Illinois. Editorial office, 155 E. 44th St., New York 17, N. Y.

ROCKWELL
EMPIRE
Oscillating Piston
WATER METERS

COST LESS TO REPAIR



ALL INTERIOR PARTS ASSEMBLE AS A COMPLETE UNIT FOR INSERTION IN CASE

Here is the simple arrangement of measuring chamber and gear train parts in Rockwell-built Empire water meters. Note there are only three interior castings. They assemble without the use of any screws. Fitting is quick, positive. The assembled mechanism can be tested for its free running qualities prior to being bolted in the meter case.

Empire meters have fewer parts—better parts—exactingly interchangeable parts. Dismantling and assembly is quick, easy—to save time and money in meter shop operations. Thus the noted initial long life of these meters can be economically renewed to give many more years of uninterrupted service.

- SIMPLE CONSTRUCTION
- INTERCHANGEABILITY
- FEWEST WORKING PARTS

TYPE 12
FOR COLD CLIMATES

TYPE 14
FOR WARM CLIMATES

Rockwell MANUFACTURING COMPANY
PITTSBURGH 8, PA.
Atlanta Boston Chicago Columbus Houston Kansas City Los Angeles
New York Pittsburgh San Francisco Seattle Tulsa

Sanitation HTH **is your useful hypochlorination friend that never lets you down. Dry, free-flowing, easy to handle and store, this 70% chlorine carrier will meet your everyday sanitizing problems—regular chlorination of water supplies, reservoirs, tanks, new mains, filters.**

When foul weather strikes and mains break, floods flash, or other emergencies arise, HTH provides the solution for large-scale, on-the-spot chlorination—*if you have it on hand!*

Don't risk being caught short. Replenish your HTH stock *now* and rely on this faithful friend—not only for today's routine chlorination jobs but for tomorrow's big ones as well. Mathieson Chemical Corporation, Mathieson Building, Baltimore 3, Maryland.

Sanitation HTH is available in cases of nine handy 5-lb. cans or 100-lb. drums.

Mathieson
CHEMICALS

Sanitation HTH . . . PH-Plus (fused alkali) . . . Liquid Chlorine . . . Chlorine Dioxide . . . Anhydrous Ammonia

8134

SERVING INDUSTRY, AGRICULTURE AND PUBLIC HEALTH

WATER & SEWAGE WORKS

WATER SUPPLY—SEWAGE DISPOSAL—INDUSTRIAL WASTE TREATMENT

E. S. GILLETTE, Publisher

L. H. ENSLOW, Editor

COMING!

A Water Rate Increase Experience

In this issue is a brief resume of the history of water meters at Halifax, Nova Scotia. Our next issue will carry an interesting review of the method and plan recently followed in developing a new schedule of water rates for Halifax. A study revealed the necessity of a 45% increase in rates which had been in effect since 1906. This article relates in detail the several factors entering into the development of the overall most equitable rate schedule that could be devised on a simple, understandable basis. The author—
IRA P. MACNAB, Gen'l. Manager,
Public Service Comm. of Halifax, N. S.

Statistical Evaluation of Analytical Data

Has not heretofore been applied except sparsely to stream study data or plant operation results in water and sewage treatment. The third of a series of articles is scheduled for October. The author is a pioneer in this statistical approach in dependably evaluating sanitary engineering data in general. He is—
Prof. CLARENCE J. VELZ
Univ. of Michigan, Ann Arbor, Mich.

Sewage Works Design Requirements

Is the title of a three part series of articles based on the official regulations and recommendations, issued within recent years, by the various states. The first article appeared in our August issue and covered "Sewerage Systems and Pumping Stations." The second article to appear soon will cover "Primary Sewage Treatment." This series has been prepared by—
LAWRENCE G. RICE, Cons. Engr.
Camp Hill, Pa.

Calibration of Residual Chlorine Equipment

More and more photometic equipment is being used for residual chlorine and other colorimetric laboratory tests. This article describes a simplified method of calibrating photometric equipment for residual chlorine determinations, as it has been developed in Detroit. This article comes from—
MICHAEL J. TARAS, Senior Chemist,
Dept. of Water Supply, Detroit.

Milk Waste Treatment

Since one of the most universal problems in industrial waste disposal is that of milk processing plants, considerable interest should be found in the results of studies involving milk waste treatment on the old reliable trickling filter. Results with the high rate filter and recirculation are especially interesting. These studies, conducted at the University of Texas, are reported by—
EARNEST F. GLOYNA, Asst. Prof.
Univ. of Texas, Austin, Tex.

Sewer Maintenance & Operation

Is the subject of a series of short pithy articles by an operator who is an advocate of "Special Tools for Special Work," as a safety and time saving economy measure. He is—
REUBEN F. BROWN, Supt.
Sewer Maint. & Operation, Los Angeles.

Mechanical Dewatering of Papermill Sludges

Has received considerable attention, because of the immediate and pressing problem of disposal of sludge from pulp and paper mill waste. This paper reports results of extensive field testing at a variety of mills, with rotary vacuum filtration, pressure filtration, and two stage vacuum filtration. This report has been prepared by—
VAUGHN C. BEHN, Development Engr.
National Council for Stream Improvement.

Anti-Corrosion Treatment and Break-Point Chlorination

Constituted the principal problems in a pilot-plant study at Maynard, Mass., in which the control of iron bacteria in the distribution system was a major consideration. The results of a combination of aeration, lime-soda treatment and break-point chlorination are told by the chemist in charge of the studies—
WERNER N. GRUNE, Project Director,
New York Univ., New York.

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Cincinnati, Ohio—

-Selects the Nichols Multiple Hearth Sludge Drier-Incinerator

Why??

These decisive Nichols features tell the story . . .

1. **Proved performance**
2. **Guaranteed lowest operation costs**
3. **Proved dependability**
4. **Drying, deodorizing and incineration in one unit.**

During the past year the following cities chose Nichols Incinerators for heat drying and incinerating sludge.

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Bridgeport, Conn., East Plant
Akron, Ohio
Providence, R. I.
Bridgeport, Conn., West Plant
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When writing, ask for Bulletin No.

Nichols Engineering & Research Corp.

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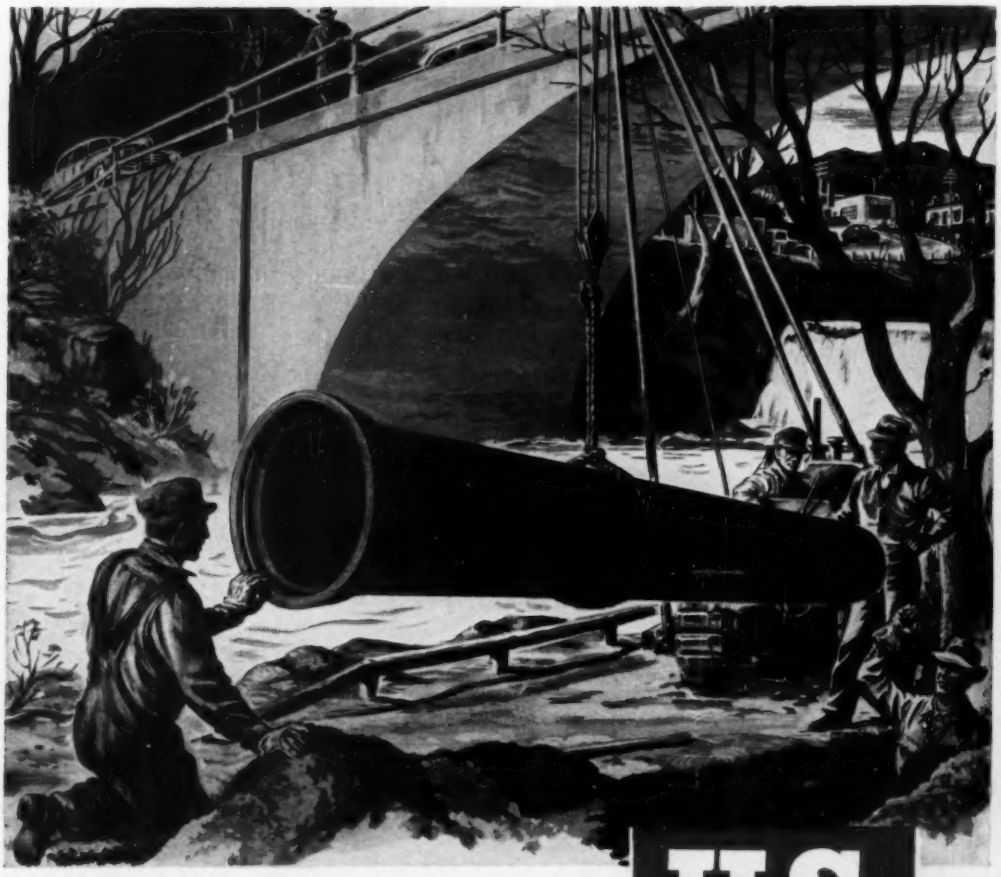
1477 SHERBROOKE ST., W., MONTREAL 25, CANADA



Painted for U. S. Pipe & Foundry Co. by Paul Lavoe

U.S.
cast iron
PIPE

IMAGINE that you have just heard about cast iron pipe for the first time! Would you not be eager to buy some? For what other pipe material used in constructing underground mains is as inexpensive to maintain? What other pipe material has a proved service record of over 100 years in city streets? What other pipe material has all the strength factors of long life that should be required of pipe to be laid in city streets? Our product has lived up to the best traditions of cast iron pressure pipe for 51 years. **United States Pipe and Foundry Co., General Offices: Burlington, New Jersey, Plants and Sales Offices Throughout U. S. A.**

CLEAN WATERS *at*

Airview of the Bird Island Sewage Treatment Works at Buffalo, N. Y. Treatment includes pumping, screening, aeration, chlorination, sedimentation, sludge digestion and incineration.

A G-E 7½-hp induction motor drives a sludge mixer. With their extra protection against physical damage, electrical breakdown and operating wear and tear, G-E motors assure long life and high service continuity.

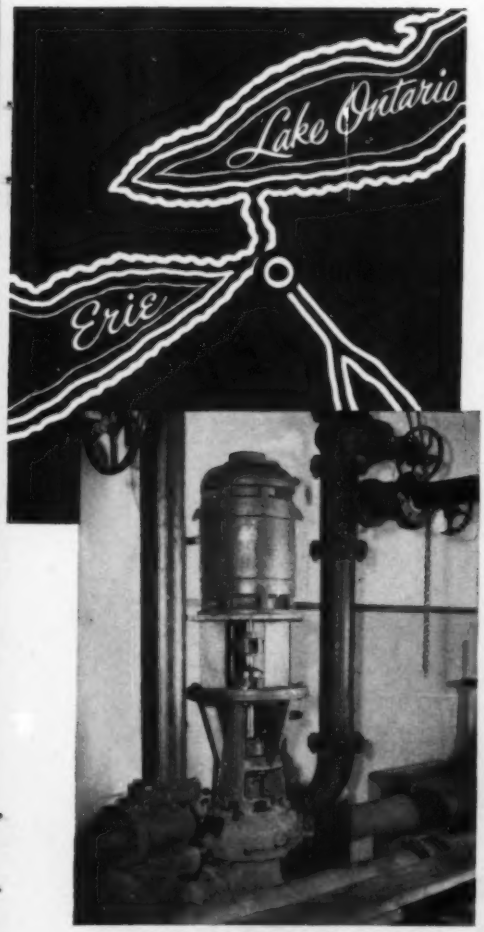
Three G-E 7½-hp splashproof induction motors drive filtrate pumps for vacuum filters. These motors have already given 12 years of service although constantly subjected to moisture from dripping and splashing.

GENERAL ELECTRIC

666-58

Buffalo HELP KEEP A TREATY

G-E Equipped Treatment Plant Guards International Waters



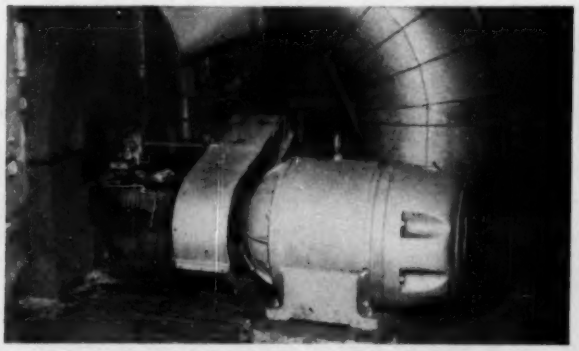
Since its dedication in 1938, Buffalo's sewage treatment plant has helped make good a U.S.–Canadian Treaty signed over 40 years ago to protect international waters from pollution. Located on Bird Island in the Niagara River, the plant has helped keep waters clean from Buffalo to Lake Ontario.

Plant officials attribute much of the success of the Buffalo plant's operation to the outstanding service given by some 100 General Electric motors. In many cases operating under the most severe conditions, the motors have given continuous and reliable performance.

General Electric can help your community get that new or improved sewage treatment plant by (1) assisting you and your consultant in formulating electrical plans, and (2) building public support through the use of G.E.'s full-color sound movie, *Clean Waters*.

Contact your General Electric representative early in the planning stage. *Apparatus Dept., General Electric Company, Schenectady, N. Y.*

Sludge circulating pumps for the digester tank are driven by G-E 10-hp vertical drip-proof motors. G-E vertical motors now have improved bearing lubrication and double-end ventilation for longer life and more efficient operation.



This is one of the G-E 50-hp, totally enclosed, fan-cooled induction motors used to drive exhaust fans for the sludge incinerator. The corrosive atmospheres in buildings like this call for motors that can take it.

GE SEWAGE-PLANT

A NEW LOW

IN VALVE REPLACEMENT COSTS

1/2 OF 1%
OVER 20 YEAR PERIOD

How many valves in your operations have served for 20 years with repair parts costing less than ½ of 1%? We'll venture to say few, if any—unless they are Nordstroms.

You can't buy lower-priced valve performance than Nordstroms. Over a 20-year period the total purchase of Nordstrom repair-replacement parts was only 46 cents per $100 worth of valves—an astounding low cost that can't be matched by any other type of valve.

That proves Nordstrom economy, endurance . . . freedom from trouble, minimum line shut-down—reliability that can't be equalled.

Get the Nordstrom habit. Every time a valve "goes out," replace it with a Nordstrom. Drop the old habit of replacing valve with like valve. Save money and up-grade your valve quality with Nordstroms.

Nordstrom Valves

NOW AUTOMATICALLY LUBRICATED WITH TRADE MARK **Hypermatic**

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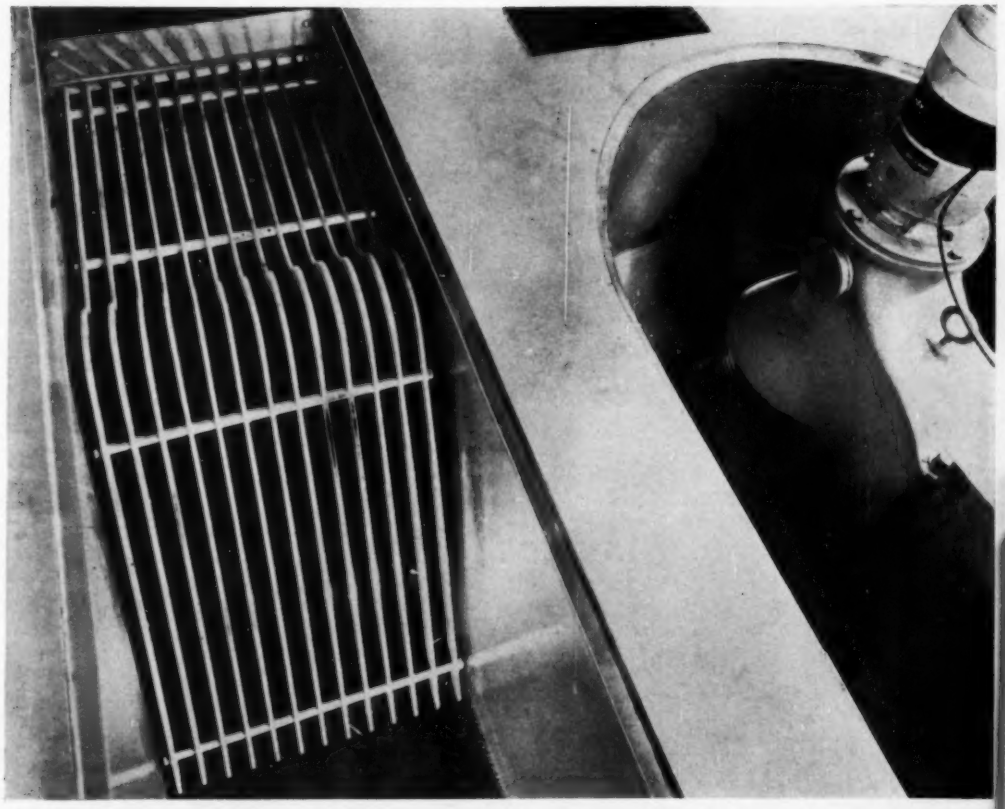

TEN-YEAR UPKEEP: ZERO

You'd never guess the new-looking bar screen, slide gates and curb angles at the Haverstraw, New York, Sewage Plant are 10 years old. More surprising, not a penny's been spent painting or repairing them in all that time . . . because they're made of Alcoa Aluminum.

Not only bar screens, but weirs, scum troughs and architectural products of Alcoa Aluminum have service records up to 20 years, without maintenance.

Your builder will be glad to fabricate equipment of light, lasting Alcoa Aluminum. You need only specify Alcoa in your designs. For more information, mail the coupon below to: ALUMINUM COMPANY OF AMERICA, 2162J Gulf Bldg., Pittsburgh 19, Pa.

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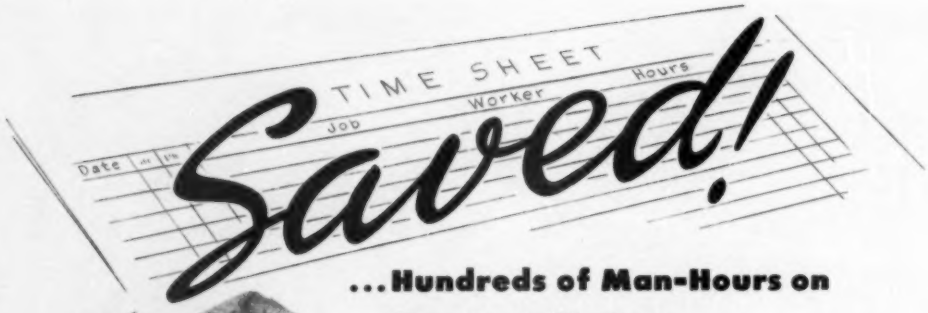


...Hundreds of Man-Hours on New Installations

YOU

CAN NOW DO AN ALL MECHANICAL-JOINT JOB WITH PIPE, FITTINGS, VALVES AND HYDRANTS

...with EDDY Mechanical-Joint Valves

After excavation, two unskilled workmen and a ratchet wrench can install Eddy Mechanical-Joint Valves in a jiffy. This can mean many man-hours saved each year. What's more, the work can be done in a flooded trench, or in any kind of weather—for no caulking, no lead-melting is needed . . . and all joints are *bottle-tight* under pressure. Valves meet AWWA specifications, and are available in sizes 3" to 12" for use on both sand-cast and centrifugally-cast iron water pipe.

...and EDDY Mechanical-Joint Fire Hydrants

Since 1849 EDDY For Long Service

Mechanical-Joint connection allows quick, easy installation or removal (with or without auxiliary valve). Hydrants also available with bell or flanged connection. All operating parts accessible by removing top cover. Hydrants open fast, close easily. Even a bent stem does not cause water loss, and drip-action prevents freeze-up. Stock up now on both Clow Mechanical-Joint Cutting-in Valves and Hydrants. Be ready to make easy, speedy installations when needed!

EDDY VALVE COMPANY

WATERFORD NEW YORK

A Subsidiary of James B. Clow & Sons

Bulletin on POROUS MEDIA by CARBORUNDUM

TRADE MARK

NO. 10 SEPTEMBER, 1950

NOW... Porous Plate Underdrain System also Lowest in First Cost

Rising construction costs in the past five years have changed the economics of ALOXITE aluminum oxide underdrain systems. Always low in maintenance and operating expenses, porous plate installations in rapid sand filters are now also lowest in initial cost — *when all factors are considered.*

High cost construction factors which are eliminated or reduced by the ALOXITE system are: graded gravel *in place,* vertical walls, certain piping, etc.

In any total cost comparison, such items are critical. Under today's conditions they add up to the fact that an ALOXITE underdrain unit — *completely aside from its greater operating efficiency and lower maintenance cost* — is the most economical filter system to be had.

Added to this low first cost, of course, are the standard benefits of the ALOXITE bottom which include: permanent protection of filter media; uniform backwashing — no mud ball formations — less wash water; low head loss; no clogging or corrosion; and simplicity of installation and operation.

Properties of ALOXITE Porous Media

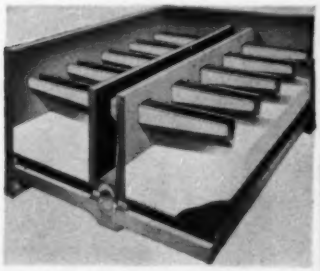
MATERIAL	Ceramically bonded crystalline aluminum oxide grain of controlled sizes.
GRADES (Pore Size)	**Filter Underdrains** ... coarse and very coarse. **Direct Filtration** ... range from very fine to medium. **Diatomite Support** ... range from fine to medium. **Air (gas) Diffusion** ... range from fine to coarse (permeability from 10 to 120).
SOLUBILITY	**In Water and Air** ... insoluble at all normal operating temperatures. **In Acids** ... generally resistant at all operating temperatures, except to hydrofluoric acid. **In Alkaline Solutions** ... ceramic bonds are progressively soluble with time and temperature increases.
STRENGTH	Transverse breaking strength is relatively good ranging from 1000 lbs./sq. in. (coarse grades) to 3000 lbs./sq. in. (fine grades).
REFRACTORINESS	All grades withstand up to 900° C. without softening.
THERMAL SHOCK RESISTANCE	Withstand changes up to 20° C./hr. (Where more severe heat shock exists, ceramically bonded silicon carbide porous media are available.)
POROSITY	Ratio of pore volume to total volume of all grades approximately 35%.
WEIGHT	Approximately 0.09 lbs./cu. in.

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company

POROUS BOTTOM TRICKLES...

In a recent bidding on filter construction at Waco, Texas, two alternate underdrain designs were offered. Every contractor submitted a lower bid for construction of the design based on porous plate underdrains.

In another southwestern city 5 filter underdrain designs were considered by the engineers before making selection. The porous plate design was estimated to be lowest in initial cost and since it was believed to be lowest in maintenance cost as well, there was no doubt about its selection.



Elimination of graded gravel by the porous plate underdrain principle frequently is of special interest in localities where gravel is not readily available (e. g., South American countries). Transportation then becomes a major expense.

LATEST POROUS MEDIA DATA

Technicians in all fields of filtration and diffusion will find this new bulletin the most complete reference source available. Its 56 pages include many charts, tables and photographs. It covers applications, design, specifications, installation and operation. No obligation, of course.

Dept. M-90
THE CARBORUNDUM COMPANY
Refractories Division
PERTH AMBOY, NEW JERSEY

For quality piping . . . complete selection
Select from the CRANE line

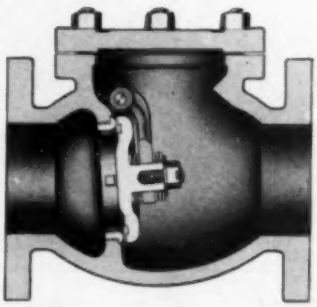
NEW DISC-HINGE CONNECTION GREATLY REDUCES WEAR

Note the improved spring loaded disc-hinge assembly on these Crane Iron Body Swing Check Valves. This patented semi-rigid connection eliminates lost motion, yet has the flexibility needed to assure true seating. Wear at the disc-hinge connection is practically eliminated.

Crane body design assures ample flow area. Disc always swings freely to give unrestricted flow; cannot stick in open position; closes securely when forward flow stops. Bolted cap construction, plus tapped and plugged body openings, provides easy access to all working parts.

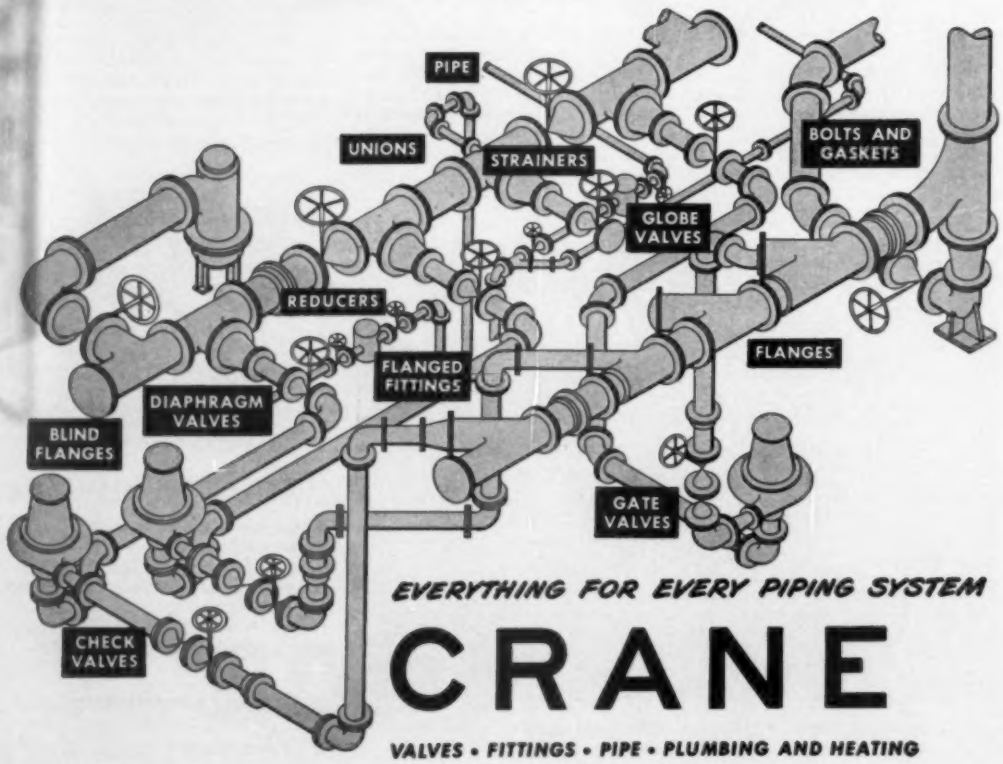
As with all Crane swing checks, these valves can be furnished with outside lever and adjustable weight when extreme sensitivity to flow reversal or to low inlet pressure is desired. Available with flanged, screwed, or hub ends. See your No. 49 Crane Catalog, p. 120-121.

CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas



No. 373 brass trimmed check, sizes 2 to 8-in. Also available with leather disc or in all-iron. Sizes 10 to 24-in. have conventional disc-hinge connection. See Crane Catalog for Working Pressures.

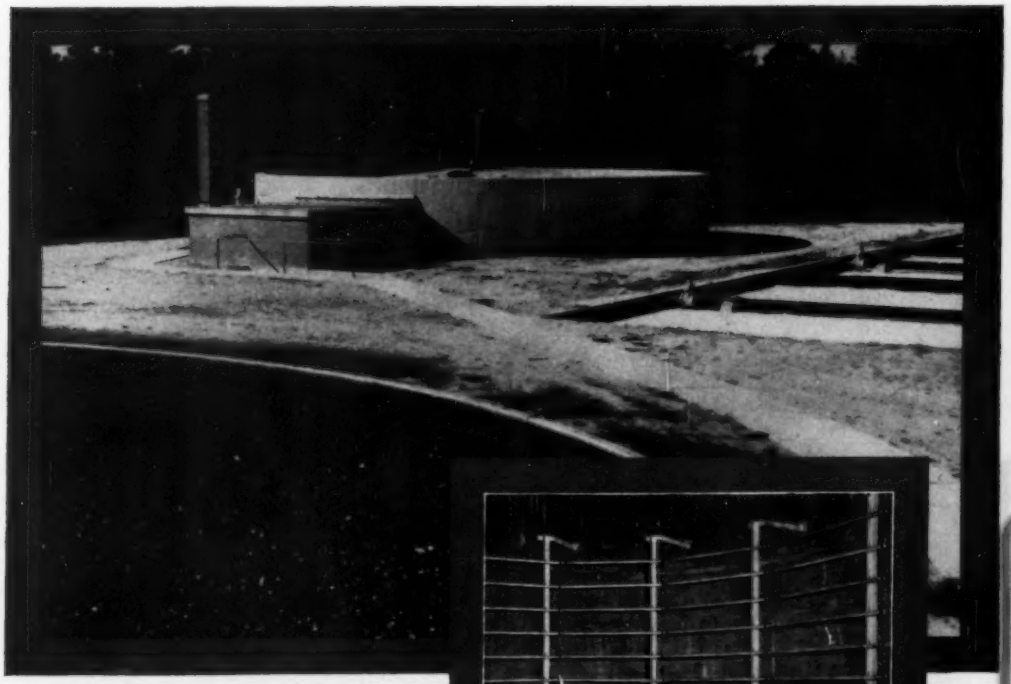
THIS SEWAGE STATION PUMP ROOM PIPING, FOR EXAMPLE, CAN BE COMPLETELY EQUIPPED ON ONE ORDER TO CRANE



EVERYTHING FOR EVERY PIPING SYSTEM

CRANE

VALVES • FITTINGS • PIPE • PLUMBING AND HEATING



The most important aid to good digestion here

→ BYERS WROUGHT IRON PIPE

Serving a community of 10,000, this new Orangeburg, S. C., sewage treatment plant is completely modern in all respects—including its answer to the corrosion problem. The digestor coils, which face extremely severe attack, as well as certain other connected services, are Byers Wrought Iron. The inset picture shows a typical digestor-coil installation. The plant was designed by Barber, Keels and Associates, and built under the supervision of City Engineer Alex T. Brown.

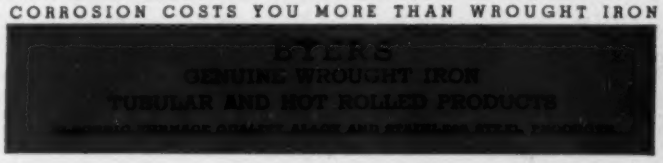
Whether your sewage treatment plant is large or small, successful, economical operation depends heavily on the proper selection of materials. The use of short-lived piping means early and costly repairs, and a heavy burden on the taxpayer. Byers Wrought Iron pipe has demonstrated its exceptional qualities in practically every corrosive service, and provides a sound means of getting maximum life from the installation, with minimum maintenance. A check of specifications of all varieties of modern plants will show how extensively engineers rely on wrought iron to combat corrosion.

The corrosion resistance of wrought iron comes from the composition and structure of the material. Tiny fibers of glass-like silicate slag, threaded through the body of high-purity iron, halt and "detour" corrosive attack, and so discourage pitting. The fibers also anchor the initial protective film, which shields the underlying metal.

If you are concerned with the design, construction or operation of a sewage treatment plant, you'll find some helpful information in our bulletin WROUGHT IRON FOR SEWAGE TREATMENT AND DISPOSAL INSTALLATIONS. A copy will be sent on request. We would like to remind you also that in any wrought iron pipe installation, the use of *wrought iron nipples* should always be specified. This will eliminate any risk of "weak-links" in your system.

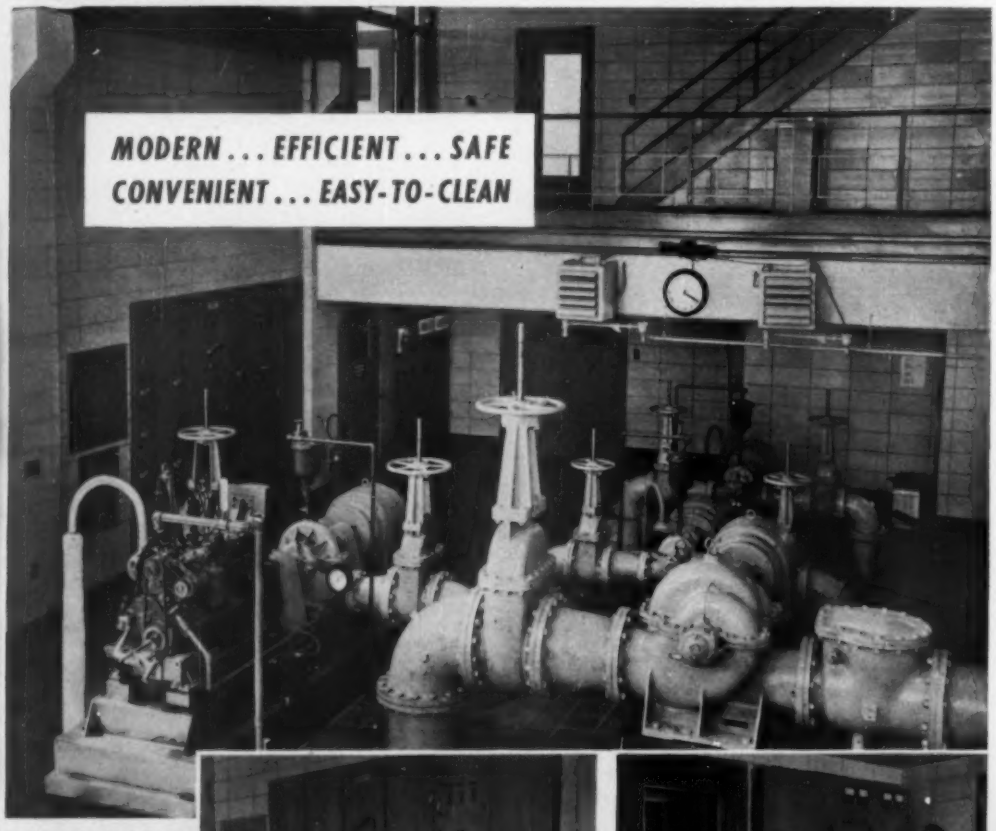
A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, Salt Lake City, San Francisco. Export Division: New York, N. Y.

CORROSION COSTS YOU MORE THAN WROUGHT IRON



YOU CAN BE **SURE**.. IF IT'S

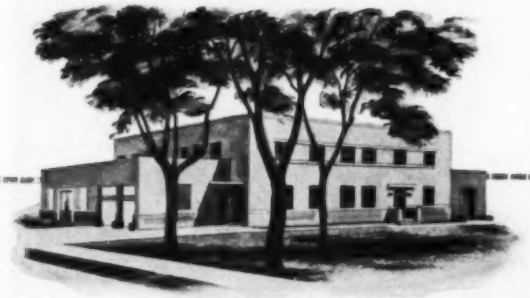
Westinghouse



Engineers: Greeley & Hansen
Plant Supt.: Alvin O. Bares

1 **Control Center**—All plant operations can be controlled from this central power distribution unit. Steel cubicles hold switches, lights, pushbuttons and breakers. Bottom sockets for plug-in instruments permit load measurement on any individual circuit. Extra cubicles make future expansion easy.

2 **Incoming Switchgear Cubicles**—include switch for each of the incoming high-voltage lines—one for regular service and the other for emergency. Safe "dead-front" cubicles enclose all live apparatus. Shown here: Superintendent Bares checks his load. Watthour meters on his left record the power and lighting loads.



How one town invests in its future

It's not a *big* town but Port Washington, Wisconsin, is looking ahead! Their new pumping and filtration plant serves 5,000 people, taking 500 thousand gallons daily from Lake Michigan. Port Washington, typical of many towns, planned that this new investment should mean dependable service, flexibility for future expansion and reduced pumping costs for 30 or 40 years to come. *Your plant can realize these same advantages.*

The electrical control equipment at Port Washington is Westinghouse throughout. It is the latest, most efficient available today——the best guarantee that the plant will still be modern many years from now. Power is distributed and utilized at maximum efficiency. Safety is paramount—at no point are live parts exposed. All operations are supervised and controlled from one central point—with push-buttons on the working units for localized control when desirable.

Through long waterworks experience Westinghouse has learned how to co-ordinate electrical equipment to best meet the needs of *your particular operation.* And whether yours is a large plant or a small one, Westinghouse can supply everything electrical needed.

When you're planning to build or modernize, get in touch early with your near-by Westinghouse office. You'll make an investment in economical, efficient equipment that will be modern for years to come. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-94858

3 **Step-Down Transformers**—and other high-voltage power apparatus are enclosed in vault behind the wall formed by the control center, switchgear cubicles and locked door.

Westinghouse

EQUIPMENT FOR PUBLIC WORKS

WESTINGHOUSE

Without bursting strength—or, for that matter—without all of the strength factors listed opposite—no pipe laid 100 years ago in *city streets* would be in service today. But, in spite of the evolution of traffic from horse-drawn vehicles to heavy trucks and buses—and today's vast complexity of subway and underground utility services—cast iron gas and water mains, laid over a century ago, are serving in the streets of more than 30 cities in the United States and Canada. Such service records prove that cast iron pipe combines all the strength factors of long life with ample margins of safety. No pipe that is provably deficient in any of these strength factors should ever be laid in city streets. Cast Iron Pipe Research Association, Thos. F. Wolfe, Engineer, 122 So. Michigan Ave., Chicago 3.

CAST IRON PIPE

Strength factors of Long Life !

No pipe that is provably deficient in any of these strength factors should ever be laid in city streets

BURSTING STRENGTH

In full length bursting tests standard 6-inch cast iron pipe withstands more than 2500 lbs. per square inch internal hydrostatic pressure, which proves ample ability to resist water-hammer or unusual working pressures.

SHOCK STRENGTH

The toughness of cast iron pipe which enables it to withstand impact and traffic shocks, as well as the hazards in handling, is demonstrated by the Impact Test. While under hydrostatic pressure and the heavy blows from a 50 pound hammer, standard 6-inch cast iron pipe does not crack until the hammer is dropped 6 times *on the same spot* from progressively increased heights of 6 inches.

CRUSHING STRENGTH

The ability of cast iron pipe to withstand external loads imposed by heavy fill and unusual traffic loads is proved by the Ring Compression Test. Standard 6-inch cast iron pipe withstands a crushing weight of more than 14,000 lbs. per foot.

BEAM STRENGTH

When cast iron pipe is subjected to beam stress caused by soil settlement, or disturbance of soil by other utilities, or resting on an obstruction, tests prove that standard 6-inch cast iron pipe in 10-foot span sustains a load of 15,000 lbs.

SERVES FOR CENTURIES

What features do you need in a Fire Hydrant?

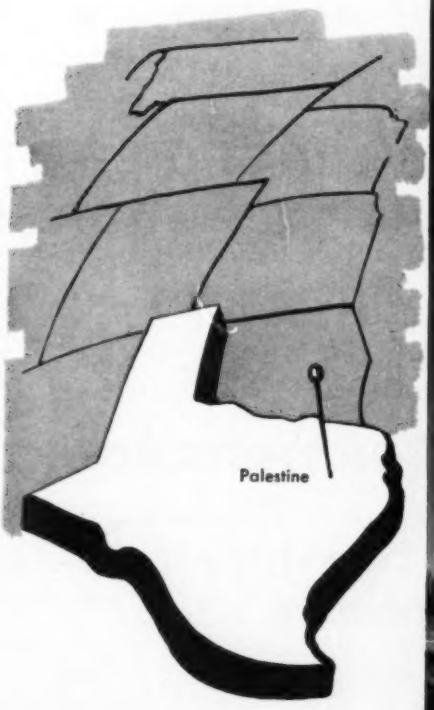
1. Ample water supply without perceptible pressure loss?
2. Easy operation despite long intervals of closure?
3. Fast, easy, one-man removal of all working parts, *including main and drain valve seats,* through the hydrant top, without disturbing hydrant barrel?
4. Extremely rugged construction for long life and resistance to damage and operating abuse?
5. Positive, *automatic* flushing of multiple drains with each operation of hydrant?

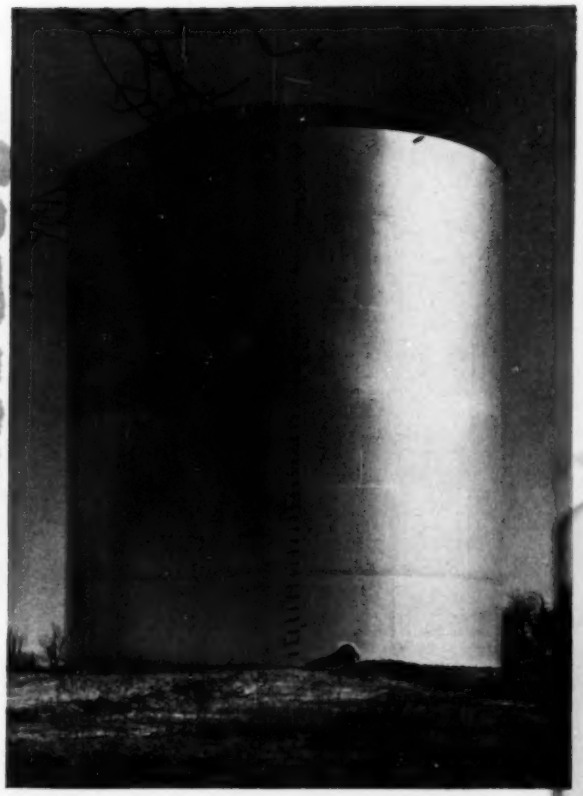
ALL OF THESE requirements, as well as other equally important features, are incorporated in modern Darling hydrants . . . to give you a big plus value in extra protection, service life and over-all operating economy.

ASK FOR BULLETIN 4410—Bulletin 4410 gives complete information on Darling's advanced features. It also describes Darling hydrants of many different types designed to best meet varying requirements while offering the extra economy of interchangeable parts.

DARLING VALVE & MANUFACTURING CO.

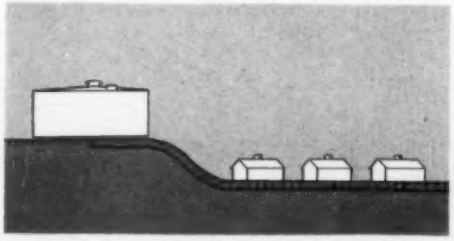
WILLIAMSPORT 11, PA.





THIRST QUENCHER . . . TEXAS STYLE

HERE'S a 500,000 gallon reason why residents of Palestine, Texas, won't go thirsty. The Horton welded steel reservoir illustrated above was installed to augment an existing 300,000-gallon water storage capacity. Now 3844 domestic and industrial users are adequately protected against most water emergencies.



This scene is being repeated throughout the country. Many communities such as Palestine are discovering that Horton welded steel reservoirs are not only an effective way to insure adequate water storage capacity but also will provide gravity pressures when natural elevations are available.

Horton welded steel reservoirs have many definite advantages . . . steel is impervious . . . the joints do not leak . . . and maintenance costs are low. They are built in standard capacities up to 10,000,000 gallons.

When writing for information about Horton reservoirs or elevated storage tanks please specify the capacity desired, approximate location, and diameter and height of special dimensions if required

• • •

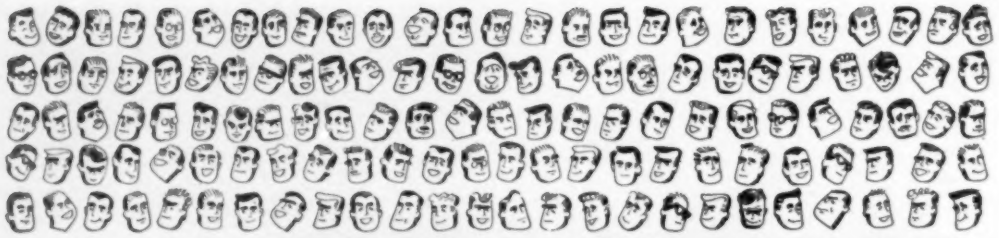
Left: Illustration showing how a steel reservoir can be located on a natural elevation to provide gravity pressure in a water distribution system.

CHICAGO BRIDGE & IRON COMPANY

Atlanta 3 ..... 2181 Healey Building
Birmingham 1 ..... 1586 North Fiftieth Street
Boston 10 ..... 1048—201 Devonshire Street
Chicago 4 ..... 2198 McCormick Building
Cleveland 15 ..... 2262 Guildhall Building
Detroit 26 ..... 1551 Lafayette Building
Houston 2 ..... 2115 National Standard Building
Havana ..... 402 Abreu Building
Los Angeles 17 ..... 1555 General Petroleum Building
New York 6 ..... 3190—165 Broadway Building
Philadelphia 3 ..... 1644—1700 Walnut Street Building
Salt Lake City 4 ..... 550 West 17th South Street
San Francisco 4 ..... 1503—200 Bush Street
Seattle 1 ..... 1350 Henry Building
Tulsa 3 ..... 1646 Hunt Building

Plants in Birmingham, Chicago, Salt Lake City, and Greenville, Pa.

In Canada—Horton Steel Works, Limited, Fort Erie, Ont.

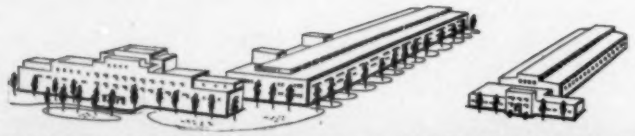


257 FIELD REPRESENTATIVES

48 INSTALLATION INSTRUCTORS

58 SALES OFFICES

5 MANUFACTURING LOCATIONS



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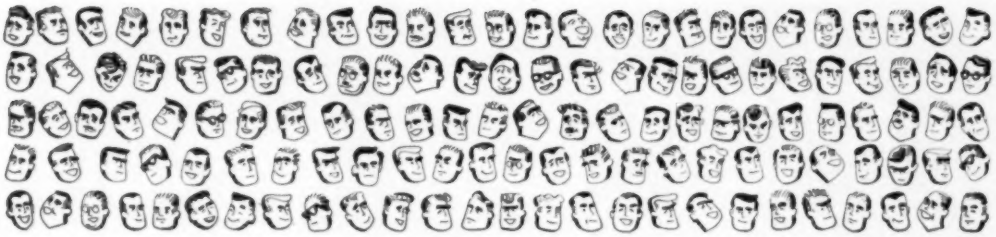


At your service—

. . . a complete, nationwide TRANSITE PIPE ORGANIZATION

Here is an organization which, over the past many years, has helped to bring a better, a more efficient and a more economical means of water transportation to many hundreds of American cities and towns.

Its facilities include more than 250 field representatives with headquarters in 58 cities. It also comprises a staff of competent installation instructors who explain recommended installation practices to pipe-laying crews. This Johns-Manville service is an important factor in helping to assure the installation economies as well as the long-term *overall* economies that go with Transite Pressure Pipe.

Behind this field organization are the modern production methods which assure the high quality of the finished product. These begin with careful selection of raw materials and are continued through the special processing operations to the final tests which each individual length of pipe must undergo before shipment is made. Five conveniently located plants now serve Transite Pipe users from coast to coast.

And back of all this is engineering—and research. For without them, the plus values that have been built into Transite Pipe would not have been possible. Today, in the new J-M Research Center, the engineer and the technician continue to find new answers to old problems. Their work is an indispensable part of the complete Transite Pipe service which Johns-Manville offers the water works industry. For further information, write Johns-Manville, Box 290, New York 16, N. Y.

*TRANSITE is a Johns-Manville registered trade mark

TRANSITE ASBESTOS-CEMENT PRESSURE PIPE

FOR BETTER WATER SERVICE

the *NEW* COLEMAN AC pH METER

offering Coleman precision . . . plus line operating convenience

- **DIRECT READING** . . . Dual scale meter calibrated 0-8 and 6-14 for continuous, direct reading of pH or millivolts. One switch for scale selection.
- **ACCURATE** . . . to 0.05 pH with proper technique. Unaffected by line voltage variations . . . fully protected from moisture and humidity.
- **FAST** . . . Instant reading . . . just flip the switch and the needle indicates the exact pH or millivolts. No annoying creep or oscillation.
- **STABLE** . . . Complete Stability 5 minutes after starting. Settings remain constant and reproducible over long periods without resetting or restandardizing.
- **CONVENIENT** . . . Easy-to-operate—Easy-to-read case is stain and corrosion proof.

Write today for Bulletin FB-221 for a full description of this New Coleman contribution to laboratory accuracy.

COLEMAN INSTRUMENTS *famous firsts* . . . . . pH ELECTROMETERS · ELECTRONIC PHOTOFLUOROMETERS · CHEMISTS SPECTROPHOTOMETERS · PHOTO-NEPHELOMETERS · ANOXIA PHOTOMETERS

MADISON STREET, MAYWOOD, ILLINOIS

Chemicals you live by

At one point in your expansion
WE CAN HELP—EXPERTLY

When the pressure is on you for action, and you can use some straight information about chemicals for water improvement, please think of DIAMOND ALKALI.

There is just one point in *your* job where *we* feel thoroughly competent! Where you use chemicals.

Even if you are not pressed for plans but would like to be forehanded about what's what in purification chemicals, get in touch with the nearest DIAMOND sales office. DIAMOND has four chlorine producing plants, located conveniently for serving the whole nation; a centrally located plant for Soda Ash and Alkali Specialties for water softening and equipment protection, and six plants producing DIAMOND Standard Silicates for settling impurities and clarifying water. One of the sales offices is surely near you: Boston, New York, Philadelphia, Pittsburgh, Cleveland, Cincinnati, Chicago, St. Louis, Memphis, and Houston. And there are representatives in other principal cities.

DIAMOND CHEMICALS FOR WATER TREATMENT

DIAMOND ALKALI COMPANY...CLEVELAND 14, OHIO

DIAMOND ALKALI CHEMICALS

A Dresser-coupled steel line delivers water cheaper...

In Jersey City, N. J., this 12,000-foot line, 48" in diameter, was speedily installed in a busy, built-up section. It tied in with two other steel mains laid in 1909 and 1918. Both of the older lines were found to be in excellent condition.

The cheapest way to deliver water to the place where it turns into revenue is with a Dresser-Coupled steel line—the line that

- **Cuts installation costs**
- **Cuts leakage losses**
- **Cuts maintenance costs**

Contractors like Dresser-Coupled steel lines because with lengths of steel pipe up to 50 feet, joints are fewer. They are *factory-made* joints, virtually foolproof. Dressers will take deflection up to 5° at each joint, eliminating the need for many costly specials. Consequently, schedules are easier to plan and easier to stick to and the job gets done faster. Crews are smaller and more easily supervised. The only tool needed to install Dressers is a wrench—no costly or hazardous equipment.

Waterworks officials like Dresser-Coupled lines because they get a better line at lower cost—a line with the bottle-tight dependability of flexible Dresser Couplings, the longevity of tough, shatterproof steel pipe, the sustained carrying capacity of modern glass-smooth linings.

From every angle—a Dresser-Coupled steel line delivers water cheaper. Ask your Dresser Sales Engineer for further information, or write today for literature.

BE SURE you get the best line at the best price. Put steel pipe and Dresser Couplings in your specifications.

DRESSER

"FLEXIBLE-TIGHT"

COUPLINGS

Dresser Manufacturing Division, 59 Fisher Ave., Bradford, Pa. (One of the Dresser Industries)—In Texas: 1121 Rothwell St., Houston. In Canada: 629 Adelaide St., W., Toronto. Sales Offices: New York, Philadelphia, Chicago, Houston, San Francisco.

SELECTED IN
1944
BECAUSE OF
Reliability and Efficiency
and
STILL PROVING IT IN
1950

DECATUR, ILLINOIS chose ACCELATORS in 1944 for their water treating plant . . installed to help serve war industries. ACCELATOR was selected because of its *remarkable performance record in over 1100 installations from coast to coast* which treat ONE BILLION *Gallons of water every day!* Simplicity of design, sturdy construction, so few movable and mechanical parts, were added considerations that won Decatur's approval. Today, *in 1950,* its reliability and operating efficiency is still being proven day after day!

Pictured below is the Decatur installation, consisting of 2 ACCELATORS, each 54 feet in diameter. Together, they can economically soften and clarify 12 MGD. Lake Decatur water is treated . . the Lake formed by damming the Sangamon River. Turbidity after treatment averages 2.0 PPM, usually less!

If treating water or waste is a subject of interest to you, by all means send for our new 28-page bulletin No. 1825. Learn how ACCELATOR can . . 1. Save up to 80% in space, 2. Give simpler operation, 3. Faster chemical reaction, 4. Higher ratings, 5. An exclusive slurry recirculating feature which produces better, clearer water in less time. Let our competent engineers help you with your problems. No obligation. Write today.

ACCELATOR®

INFILCO
• BETTER WATER CONDITIONING • AND WASTE TREATMENT SINCE 1894

INFILCO INC.

GENERAL OFFICES: 325 WEST 25th PLACE • CHICAGO 16, ILLINOIS
SALES OFFICES IN TWENTY SIX PRINCIPAL CITIES

WORLD'S LEADING MANUFACTURERS OF WATER CONDITIONING AND WASTE TREATING EQUIPMENT

Now! POMONA

brings you

5 Big New Advantages

The Fairbanks-Morse Pomona Vertical Deepwell Turbine Pump always did give you more for your pump dollar. NOW, it's even better. New water-lubricated, external sleeve bearing assembly brings you these five important advantages:

1. Longer-life wearing surface
2. Positive, continuous flushing action
3. No liquid entry between shaft and sleeve bearing
4. Minimum friction and shaft bearing losses
5. Easy, simple field replacement of worn sleeves

This new advance in turbine pump bearing design assures maximum life of the bearing assembly without any sacrifice in line shaft streamlining and bowl efficiencies. The full-floating, spiral groove, natural rubber bearing assures positive, efficient water lubrication. The grooves provide continuous flow from end to end of the bearing and eliminate any possibility of sand particles traveling across the full face of the bearing.

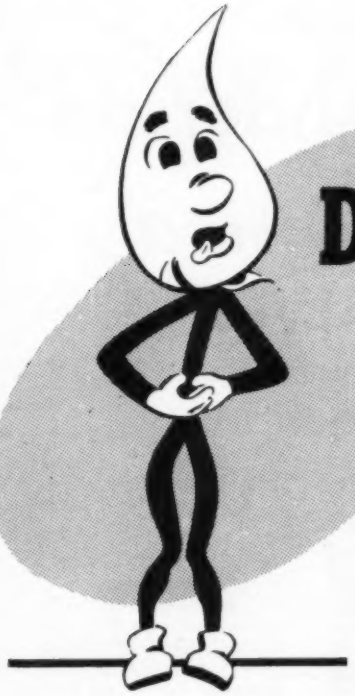
Add them all up and you'll see why you get maximum efficiency . . . longest life . . . lowest maintenance costs with Pomona. Your branch pump engineer or Fairbanks-Morse Pomona Dealer will be happy to give you the full details. Or, if you prefer, write direct to Fairbanks, Morse & Co., Chicago 5, Ill.

FAIRBANKS-MORSE,

a name worth remembering

DIESEL LOCOMOTIVES AND ENGINES • ELECTRICAL MACHINERY • PUMPS • SCALES
HOME WATER SERVICE AND HEATING EQUIPMENT • RAIL CARS • FARM MACHINERY

New, spiral groove, natural rubber bearing.



CALL FOR

Dr. Aqua Nuchar

WILLING WATER'S HAD TOO MANY CUCUMBERS

Your sure cure for sudden objectionable tastes and odors in your water supply is to use Aqua Nuchar Activated Carbon in sufficient quantities to remove these impurities that cause unpalatable water.

Aqua Nuchar Activated Carbon, because of its microscopic fineness, has amazing ability to remove by adsorption the tastes and odors that affect your water supply. The extraordinary porosity of Aqua Nuchar not only results in greater adsorption because of the larger surface area exposed, but also accounts for its superior properties of dispersion and suspendability. This all adds up to more palatable water at a very inconsequential per capita cost.

Aqua Nuchar Activated Carbon has been demonstrated conclusively to be the most effective, economical method of eliminating tastes and odors from water supplies. Check your Aqua Nuchar stocks today and be prepared for any change that may arise in your raw water supply.

OTHER PRODUCTS

Snow Top Precipitated Calcium Carbonate • Nuchar Activated Carbons • Liqro Crude Tall Oil • Indusoil Distilled Tall Oil • Tallene Tall Oil Pitch • Tallex Abietic Acid • Polycel Cellulose Fibers • Indulin (lignin)

INSURES PALATABLE DRINKING WATER
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Prevent Hammer or Shock

Specify Golden-Anderson "Cushioned" VALVES

for municipal water works systems

Cushioned Altitude Valve for automatic water level control.

Cushioned Swing Check Valve for automatic operation with pump.

Cushioned Relief Valve to remove surge and hammer.

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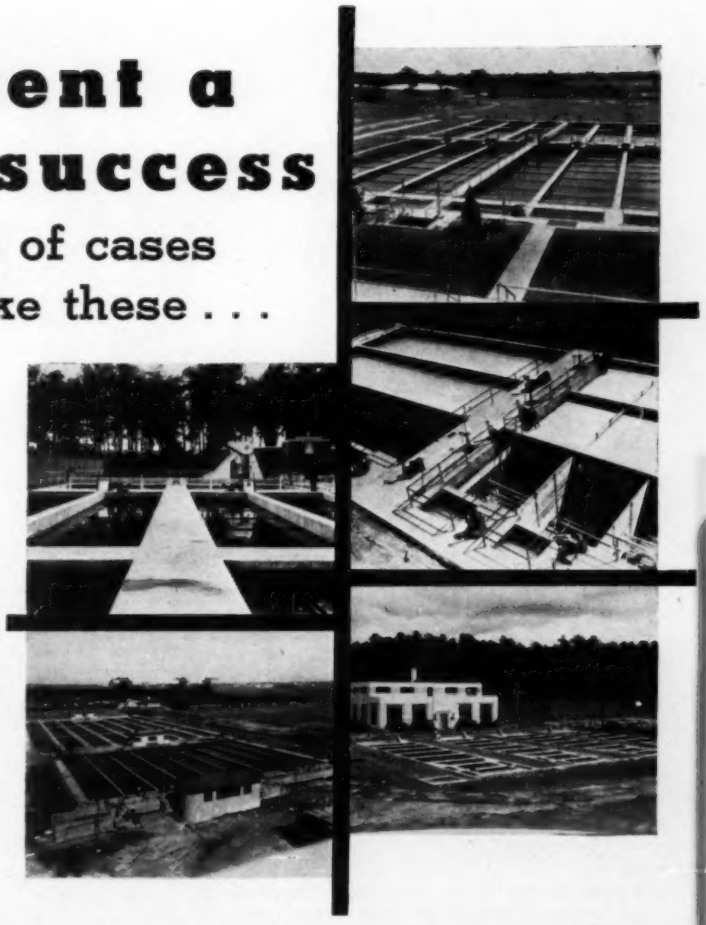
2073 KEENAN BUILDING • PITTSBURGH 22, PA.

LIFE AND PROPERTY PROTECTION
VALVES
FOR OVER 30 YEARS

treatment a success

in hundreds of cases like these . . .



Five Jeffrey-equipped treatment plants are shown here. They include towns and cities serving populations ranging from 1500 to several million. Find out about Jeffrey Collectors, Bar Screens, FLOCTROLS, Grit Washers, Sludge Elevators, Scum Removers, Chemical Feeders, Screenings Grinders, etc.

When you really want to correct your ills you go to a specialist. That is just good sense. Many cities with growing pains have called in Jeffrey, M D (Mechanically-Designed) for equipment to treat water and sewage effectively. Jeffrey Sanitation Engineers are specialists. You can turn your problem over to them with full confidence for it's a TREAT TO GET GOOD TREATMENT.

THE JEFFREY MANUFACTURING COMPANY

Established 1877

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Complete Line of Material Handling, Processing and Mining Equipment

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Built and Installed
BY PEOPLE WHO KNOW HOW

Let's be quite frank about what it takes to build a completely satisfactory, long-lasting Well Water System. As an almost entirely underground construction job, there must be a lot of know how; skill and experience gained over a long period of years in the building of thousands of Well Water Systems, otherwise many costly errors may be made.

In all the world there is no firm that equals Layne in skill; none that has had so much experience and none that is known to be so successful. Layne has built many successful systems where others have failed, proving that skill was the needed factor.

Layne constructs perhaps more big Well Water Systems than any other firm in the Nation. In addition to skill, Layne can offer the finest types of equipment, some of which they build for their exclusive use.

If you want helpful information on a water supply problem, you may call on Layne without obligation. For latest catalogs, bulletins, etc., address

LAYNE & BOWLER, INC.
General Offices, Memphis 8, Tenn.

NEW!—just off of the press—a bulletin on Layne Short Coupled Service Pumps, showing many diagrams of application for circulating and process pumping, lake and river intakes, drainage, line boosters and de-watering uses. Write for your copy today.

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LAYNE
WELL WATER SYSTEMS
VERTICAL *Turbine* PUMPS

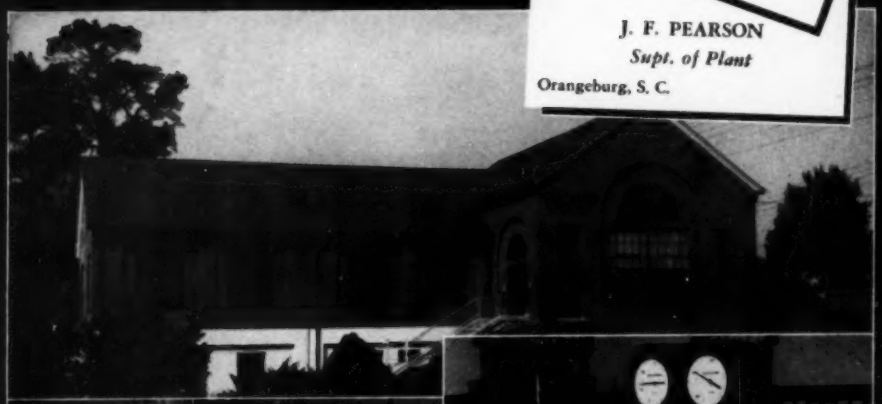
ORANGEBURG, S. C.

Water and Light Plant

(ADDITION COMPLETED IN 1949)

BARBER, KEELS & ASSOCIATES
Consulting Engineers
Columbia, S. C.

J. F. PEARSON
Supt. of Plant
Orangeburg, S. C.



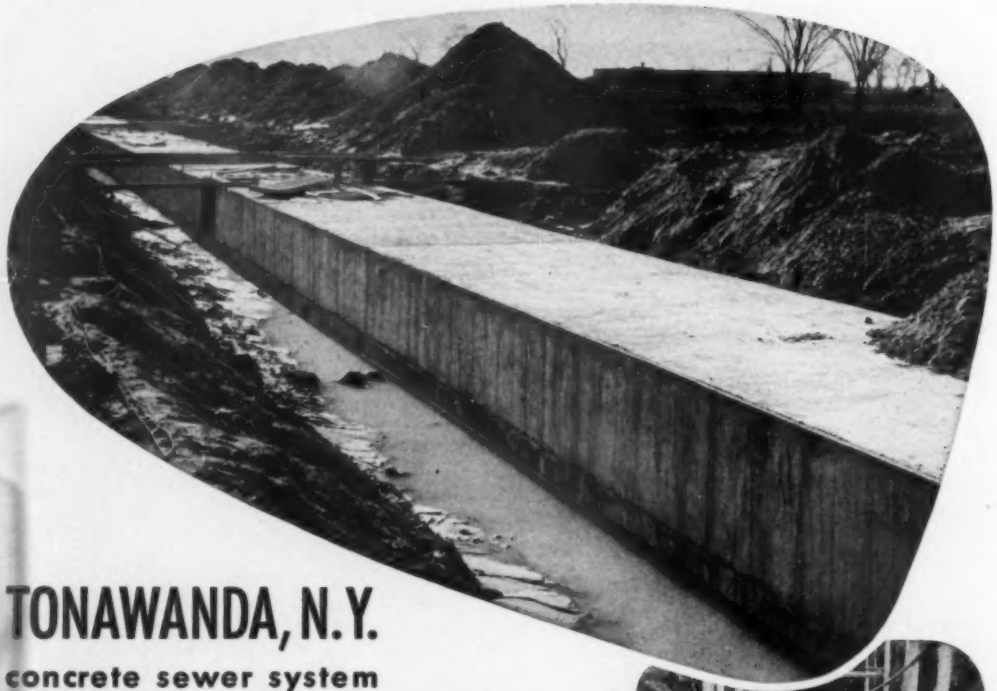
Builders Equipment furnished for the Orangeburg Water and Light Plant:

10" Venturi Tube with Type Y Register-Indicator-Recorder
10" Venturi Tube with Type M Register-Indicator-Recorder
12" Venturi Tube with Chronoflo Transmitter and Totalizer-Indicator-Recorder
6" Rate Controllers
Filter Operating Tables with Loss of Head and Rate of Flow Indicating Gauges
Wheeler Filter Bottoms

This major addition to the Orangeburg, S. C., Water Plant steps up the plant capacity and its efficiency as well. It represents an important advancement for the City, considerably augmenting the water supply facilities previously built.

As designed and supervised by Barber, Keels and Associates, the new addition brings the plant's rated capacity up to 2 MGD — an ample supply of pure water for the 12,000 population served. Through the use of Builders Water Works Equipment, the flows through the plant can be conveniently observed and closely regulated for optimum plant efficiency. For Bulletins describing Builders Water Works Equipment, address Builders-Providence, Inc. (Division of Builders Iron Foundry), Providence 1, R. I.

BUILDERS PROVIDENCE
Instruments



TONAWANDA, N.Y.

concrete sewer system features many types of construction

LEGEND says Tonawanda, N.Y. means "swift water." The growth of this industrial city has been so rapid, however, that east side residents frequently found their sewers did not flow swiftly enough. Because of inadequate storm sewers, storm waters emptied into sanitary sewers, which backed up with every heavy rain, flooding basements and endangering health.

To solve this problem a new concrete storm sewer system, unusual in many respects, was built. It includes more than 3½ miles of reinforced concrete box sewer 16 ft. x 7 ft., 10 ft. x 7 ft., 7 ft. x 6 ft. and a dual 9-ft. x 7-ft. section. The system also required more than two miles of reinforced concrete sewer pipe ranging in size from 18 in. to 78 in.

The Tonawanda Town Board officials believe that the funds expended for this project will be repaid in taxes many times because of increased valuation from developments in the area. Already industrial, apartment and retail store building have boomed and more than 1,500 homes have been completed.

Concrete sewer structures such as these render lifetime service. First cost is moderate and maintenance requirements are quite low. The result is ***low-annual-cost*** sewer service.

Upper photo shows completed reinforced concrete box sewer, 7 ft. high x 16 ft. wide, before backfilling, on section A of project. McLain Construction Co., contractor. Lower photo shows installation of 66-in. reinforced concrete sewer pipe in a 24-ft. cut on section D of project. Herbert F. Darling, contractor. Nussbaumer & Clarke, consulting engineers on entire project.

PORTLAND CEMENT ASSOCIATION

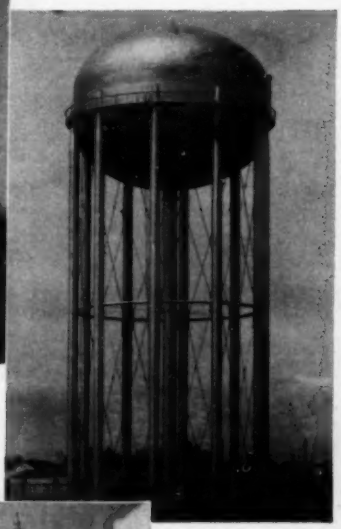
33 WEST GRAND AVENUE, CHICAGO 10, ILLINOIS

A national organization to improve and extend the uses of portland cement and concrete through scientific research and engineering field work

EVERY TYPE AND SIZE—
FOR EVERY NEED!

Elevated Steel Tanks

by PITTSBURGH • DES MOINES



Write today for our complete Elevated Steel Tank Brochure

For all municipal water storage requirements, Pittsburgh-Des Moines Elevated Steel Tanks are supplied in a wide range of designs, and in capacities up to 2,500,000 gallons. • Uniform pressures around the clock, supply during interruptions in pumping, lower pumping costs are but a few of the many reasons for this low-cost investment.

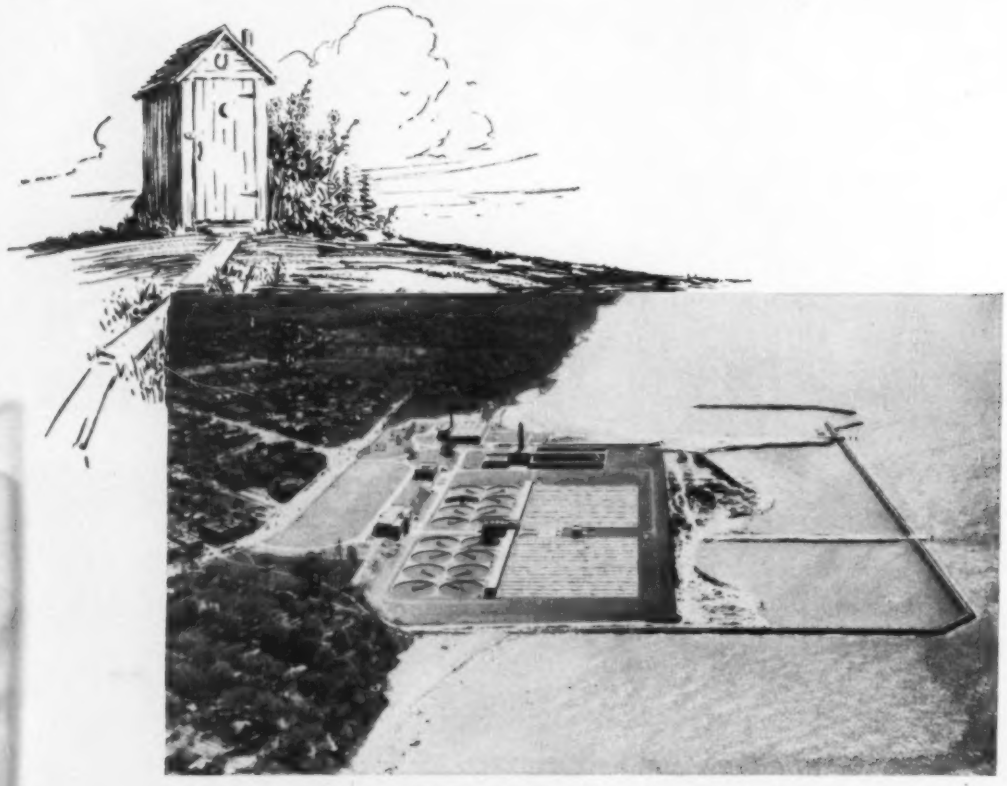
May we discuss the facts with you?

PITTSBURGH • DES MOINES STEEL CO.

Plants at PITTSBURGH, DES MOINES and SANTA CLARA

Sales Offices at:

PITTSBURGH (25)	3418 Neville Island	DES MOINES (8)	919 Tuttle St.
NEW YORK (7)	Room 918, 270 Broadway	DALLAS (1)	1223 Praetorian Bldg.
CHICAGO (3)	1222 First National Bank Bldg.	SEATTLE	926 Lane Street
	SANTA CLARA, CAL.	625 Alviso Road	



NOW MODERN Disposal Plants *WITH* ROTOVALVES *IN SERVICE*

LEADING in design and construction to meet peoples' needs, prominent engineers have turned, in ever-increasing numbers, to Rotovalves by Smith. For here is a cone valve in which the plug lifts, rotates and seats itself; which provides minimum loss, and gives positive, quick action. Obtainable in a complete line of sizes, with either manual, hydraulic or motor control, for *stop* and *check service* for Sewage and general Sanitation needs. *Shipment from stock.* Send for full data pertaining to your *own* problem!

S. MORGAN SMITH Co.

YORK, PENNA. U.S.A.

IN *TIPTOP SHAPE* AFTER 22 YEARS

One of the many users of NO-OX-ID rust preventives has this to say . . . "the interior of our 100,000 gallon sprinkler tank has been coated with NO-OX-ID "A Special" every five years, and the interior is in excellent condition, we think, solely because of the use of your product."

This is typical of the reports we get from customers who have been receiving the benefits of NO-OX-ID protection against corrosion for many years. NO-OX-IDs not only protect the interior of water tanks against corrosion, but they also protect and beautify the exterior. Consult your Dearborn engineer . . . he will be glad to discuss with you your rust preventive problems.

SEND FOR "NO-OX-ID VERSUS WATER"

It's an interesting booklet which demonstrates the many uses and benefits of NO-OX-IDs in the water works field.

DEARBORN CHEMICAL COMPANY
310 S. Michigan Ave. • Chicago 4, Ill.

Dearborn
Reg. U.S. Pat. Off.
THE ORIGINAL RUST PREVENTIVE
NO – OX – ID
IRON + OX = RUST

Dearborn Chemical Company
310 S. Michigan Ave., Dept. WS
Chicago 4, Illinois

Gentlemen:

Please send me a copy of Dearborn "NO-OX-ID Versus WATER" booklet.

Name.....

Company.....

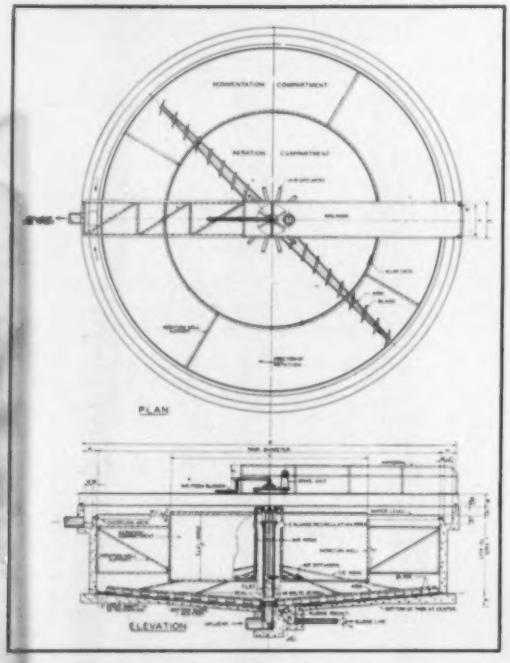
Address.....

City.....*State*.....

Why More and More Engineers Specify

THE PROCESS OXIDATOR

Reason: "Removal of suspended solids 75% to 85%"



TYPE BA

Description: The Process Oxidator combines aeration, coagulation and sedimentation in a single circular tank for the removal of suspended matter from liquids. The influent enters upward through a center column, discharges into an inner circular compartment for aeration and circulation with previously formed flocs and then passes to an outer annular compartment for upflow sedimentation. Settled solids are raked to a central sludge outlet while effluent overflows a peripheral weir. The Oxidator is flexible, permitting long or short aeration periods, gentle or intense aeration. The volume of sludge recirculated is adjustable to the incoming flow. Improved economical clarification is achieved by concentrating solids in an aerobic environment conducive to the flocculation necessary to remove colloidal and gelatinous suspended matter.

Yes—in sewage treatment the average single-stage Oxidator removes 50% more suspended solids than the ordinary clarifier and at only a 10% average increase in total plant installation costs!

This results in

- **IMPROVED CLARIFICATION**
- **INCREASED GREASE REMOVAL**
- **MINIMUM SCUM HANDLING**
- **GREATER REDUCTION IN BIOLOGICAL OXYGEN DEMAND**
- **REDUCED LOADING TO BIOLOGICAL FILTERS, THEREBY REDUCING SIZE AND COST**

Sizes: Process Oxidators are now in operation ranging from 15' in diameter to 115' in diameter. Recommended overflow rates based on gross tank area: 0.75 gpm per square foot at maximum influent rate.

Pictured below is a 40'-dia., Process Oxidator at Hemet, Calif.

Send for Bulletin 106 for information about this new development in sewage treatment that will mean lower initial expenditures and higher removals at greatly reduced cost per ppm removed. If you have a particular problem, contact one of the offices below and a specialized engineer will be glad to be of service to you.

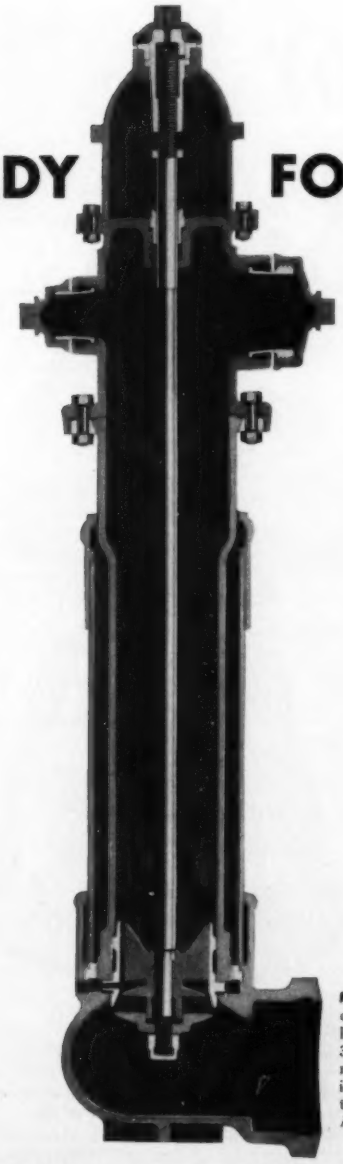
PROCESS ENGINEERS INCORPORATED

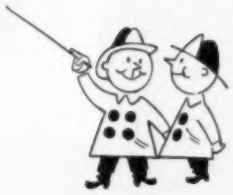
821 MARKET STREET
SAN FRANCISCO 3, CALIF.

6381 HOLLYWOOD BLVD.
LOS ANGELES 28, CALIF.

EASTERN AND MIDDLE WESTERN REPRESENTATIVE:
PACIFIC FLUSH-TANK COMPANY • 4241 RAVENSWOOD AVE., CHICAGO 13, ILL.

READY FOR INSTANT USE





There's no place where rust or ice can form to interfere with the functioning of the Mathews Modernized Hydrant. The operating thread is above the water, separated from it by the stuffing box plate. This plate is cast integral with the nozzle section and, with the packing, provides a positively leakproof construction.

MATHEWS MODERNIZED HYDRANTS SET THE PACE: Easily maintained, because simple in construction • All working parts contained in replaceable barrel • Stuffing box cast integral with nozzle section • Head can be turned 360° • Replaceable head • Nozzle sections easily changed • Nozzle levels raised or lowered without excavating • Protection case of "Sand-Spun" cast iron for extra strength, toughness, elasticity • Operating thread only part to be lubricated • A modern barrel makes an old Mathews good as new Available in sizes 4" to 16" with mechanical joint pipe connections.

MATHEWS HYDRANTS

THE FIREMAN'S FRIEND

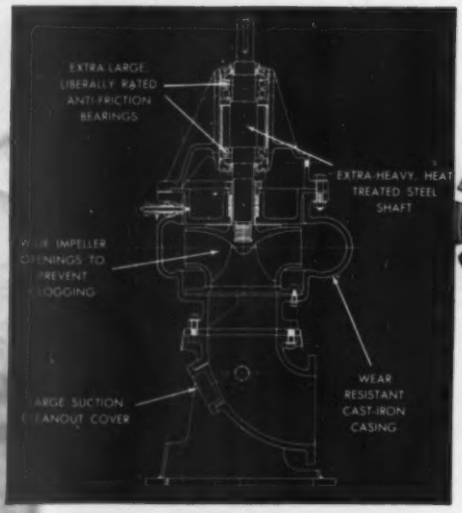
Made by R. D. Wood Company

Public Ledger Bldg., Independence Square, Phila. 5, Pa.

Manufacturers of "Sand-Spun" Pipe (centrifugally cast in sand molds) and R. D. Wood Gate Valves

A BRUTE for Punishment!

ALLIS-CHALMERS
Sewage Pump


EXTRA-LARGE LIBERALLY RATED ANTI-FRICTION BEARINGS
EXTRA-HEAVY, HEAT TREATED STEEL SHAFT
WIDE IMPELLER OPENINGS TO PREVENT CLOGGING
WEAR RESISTANT CAST-IRON CASING
LARGE SUCTION CLEANOUT COVER

GENEROUSLY DESIGNED AND HEAVILY CONSTRUCTED TO GIVE YOU LONG-LIFE OPERATION AND LOW MAINTENANCE

FROM SHAFT TO BASE, extra-heavy construction in this new sewage pump adds up to long wear and low maintenance.

The shaft is heavier than in conventional sewage pumps—and made of open-hearth, heat-treated steel selected for high shock strength to resist breakage. Anti-friction bearings are extra-large and liberally rated. Impeller inlets are rounded-off, generously large to prevent clogging.

A radially-split casing makes it easy to remove the complete rotating element by simply removing the universal coupling and loosening a few bolts. You do it all in a few minutes and don't have to disturb the intake or discharge piping.

Standard sizes to 10,000 gpm — can be built larger. See your nearest A-C Sales Office or write for Bulletin 08B7504 for more complete details on this new pump. A-3113

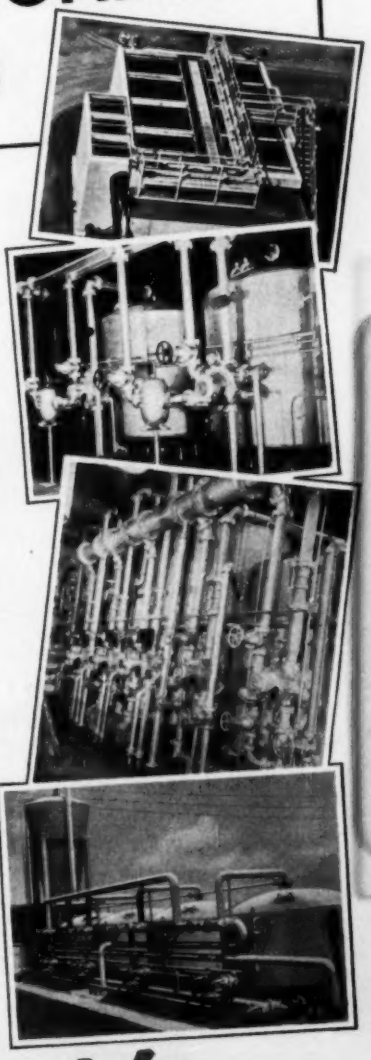
ALLIS-CHALMERS, 1192A SO. 70 ST.
MILWAUKEE, WIS.

ALLIS-CHALMERS

Texrope is an Allis-Chalmers trademark.

World's Widest Range of Public Works Equipment

4 good reasons why Permutit is WATER CONDITIONING HEADQUARTERS



1. Precipitation

The Permutit® Precipitator offers a most efficient means of removing water impurities. Operating by precipitation, adsorption, settling, and upward filtration, it can save you up to 50% in space, 40% in chemicals, and 75% in treatment time. Applications include softening; removal of turbidity, color, taste, odor, alkalinity, silica, fluorides.

2. Water Softening

The ion exchange (zeolite) process for softening or demineralizing water—recognized as the simplest method—was originated by Permutit. Present-day equipment includes fully automatic units with simplified controls, and manually controlled multiport valves, both giving improved performance. Permutit can furnish the correct ion exchanger for any requirements.

3. Iron Removal

Pulp, paper and textile mills, chemical plants, tanneries and other industries requiring water low in iron content depend on Permutit equipment. Permutit processes for iron removal include base exchange; oxidation by manganese zeolites; aeration, settling and filtration; and other processes to meet any specific requirement.

4. Cold Lime-soda Treatment

The new Permutit Spiractor® requires far less space and treatment time than earlier types of lime-soda equipment. In the Spiractor, the precipitates accumulate on solid nuclei to form large, heavy granules that can be separated from the water at relatively high flow rates. No sludge is formed; the granules can be disposed of easily.

For full information about these or any other water conditioning processes, write to The Permutit Company, Dept. W 9, 330 West 42nd Street, New York 18, N. Y., or to Permutit Company of Canada, Ltd., 6975 Jeanne Mance Street, Montreal.

Permutit

Water Conditioning Headquarters For Over 37 Years

FOR WATER FLUORIDATION

depend on the uniform high purity of BLOCKSON Chemicals

BLOCKSON
CHEMICALS

BLOCKSON sodium fluoride

FORMULA: NaF
STRENGTH: *98% NaF*
45% F
pH of 1% solution 6.5
SOLUBILITY: *60°F. 4 parts in 100 parts water*

Blockson Sodium Fluoride has a minimum purity of 98%. Fluorine content 45%. It is a white, free flowing crystalline product supplied in anhydrous powdered or crystalline form as listed below.
The dust-free crystal grade can be used as a bed through which water is percolated to form a saturated solution of Sodium Fluoride.

GRADES: **Powder, White:**
95% through 200 mesh
97% through 325 mesh
Density 65 pounds/cubic foot

Crystal, White:
100% through 20 mesh
2% through 80 mesh
Density 90 pounds/cubic foot

BLOCKSON sodium silicofluoride

FORMULA: Na_2SiF_6
STRENGTH: *98.5% Na_2SiF_6, 60% F*
pH of saturated solution 3.5
SOLUBILITY: *75°F. .75 parts in 100 parts water*

Blockson Sodium Silicofluoride is a white free flowing, odorless, anhydrous powder. Fluorine content 60%. When added to water, the alkalinity in the water dissociates the Sodium Silicofluoride to Sodium Fluoride.
Blockson Sodium Silicofluoride will be generally available for water fluoridation in ample quantities at low cost.

GRADES: **Standard, White:**
100% through 40 mesh
95% through 100 mesh
Density 72 pounds/cubic foot

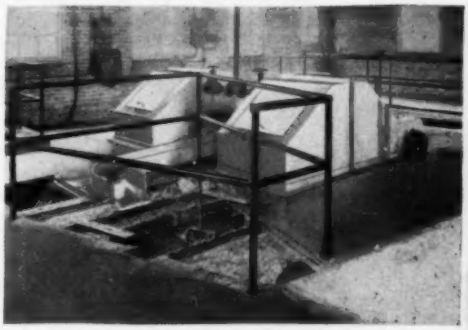
BLOCKSON IS ONE OF THE LARGEST PRODUCERS OF THESE TWO PRODUCTS—ASSURING A DEPENDABLE SOURCE OF SUPPLY
Write for Samples

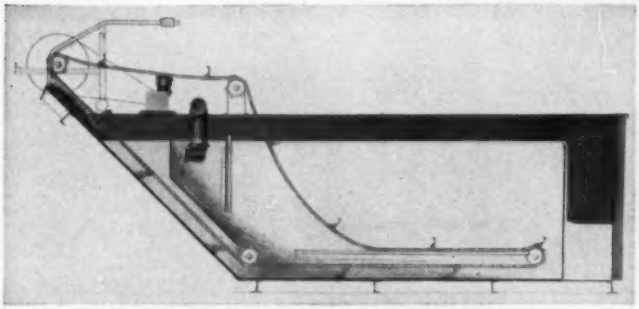
BLOCKSON CHEMICAL CO. • JOLIET, ILLINOIS

Let Link-Belt Help You Dispose of *Industrial Wastes*

Safeguard public health or salvage valuable by-products from waste water, or perhaps do both, by means of Link-Belt equipment for water, sewage and industrial waste treatment. Note the four typical applications here shown.

Link-Belt engineers, with a broad line of equipment and extensive experience, can aid you in planning and installing the right type of plant to solve your specific waste problems.





Above: Waste recovery system at large glue factory, consisting of enclosed revolving screens with settling pit and dewatering screw conveyor for the screenings.

Left: Coolant clarifying system utilizing Link-Belt dewatering conveyor. After clarification, coolant may be filtered or returned direct to grinding machines.

Left: Paper stock is recovered in the Link-Belt Save-All by a mechanical skimmer which collects the floating stock with a minimum of water.

Left: Heavy grit and detritus is removed from flume water at sugar beet factories, by settling in a tank equipped with a Link-Belt grit collector.

The Link-Belt line includes screens, sludge collectors, grit collectors, grit washers, chemical mixers, sludge dryers, power transmitting, elevating and conveying machinery.

LINK-BELT COMPANY

Philadelphia 40, Chicago 9, Indianapolis 6, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices in Principal Cities. 11,813

LINK-BELT

Sanitary Engineering Equipment

SEE OUR EXHIBIT—F.S.W.A. CONVENTION—WASHINGTON, D. C.—OCTOBER 9-12

HERE ARE ALL THE FEATURES YOU'RE LOOKING FOR

THE CYLINDRICAL PLUG of an a.c.f. type valve needs no lifting from a tapered seat:

- Quick operation, if needed
- A quarter turn—full flow
- A quarter turn—full shut-off
- Straight-through flow—most desirable
- *Round* full pipe area port*—no restriction
- No exposed seats when on flow—no abrasion
- Lubricated—for long life and corrosion protection.

*Can be supplied in rectangular port with full area.

a.c.f. CYLINDRICAL FULL PIPE AREA LUBRICATED **PLUG VALVES**

Representatives in more than 50 principal cities.

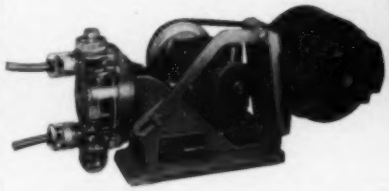
Ideal for sewage operations. Ask for catalog 4-WS. American Car and Foundry Company, Valve Division, 1501 Ferry Ave., East, Detroit, Michigan.

IN OUR TOWN WE PREFER SODIUM FLUORIDE SOLUTION!

SODIUM SILICO FLUORIDE SLURRY IS THE CHOICE FOR OUR CITY!

WE USE HYDROFLUORIC ACID IN OUR MUNICIPALITY!

We ALL use % PROPORTIONEERS % Fluoridation Equipment



HEAVY DUTY MIDGET — ideal chemical feeder for fluoridation of small or medium sized water systems at pressures up to 85 psi.

HEAVY DUTY CHEM-O-FEEDER — available in Simplex, Duplex, and Triplex models, for pressures to 125 psi and for the widest range of fluoridation requirements.

Whatever fluoride compound you select, %Proportioneers% has the Chemical Feeder to do the fluoridation job accurately, safely, dependably. Regardless of the size of the community — small town, city, or great municipality — it's the natural thing for water works men to pick %Proportioneers% Feeders for fluoridation of water supplies. Buyers of %Proportioneers% equipment profit from our more than five years of experience in this modern water treatment technique. For engineering Bulletin SAN-9, the complete story on fluoride feeding, write %Proportioneers, Inc.%, 350 Harris Ave., Providence 1, Rhode Island.

% PROPORTIONEERS, INC. %

%PROPORTIONEERS% OFFERS A COMPLETE LINE OF ACCURATE EQUIPMENT WITH ACCESSORIES FOR AUTOMATIC AND PROPORTIONAL HANDLING OF FLUORIDE COMPOUNDS.

"Hey, Joe! Did you ever see a $100 bolt?"

JOE: "What d'ya mean, a hundred-dollar bolt?"

GUS: "Just what I said. We're raising Number 3 Gate just now and this anchor bolt let go."

JOE: "But we put that gate in less than two years ago, and..."

GUS: "Yeah, I know. But we used ordinary bolts and this one's already rusted through. It'll cost at least a hundred bucks to take that gate out, dig the old bolt out of the concrete and set a new one in."

JOE: "I guess it will. But from here out we don't make that mistake twice. From now on everything that goes in is Everdur."

Most sewage and waterworks engineers have discovered that the most economical way to lick the corrosion problem in their plants is to use Everdur*—ANACONDA's copper-silicon group of alloys. There are plants where equipment made of Everdur has been doing it for over 22 years.

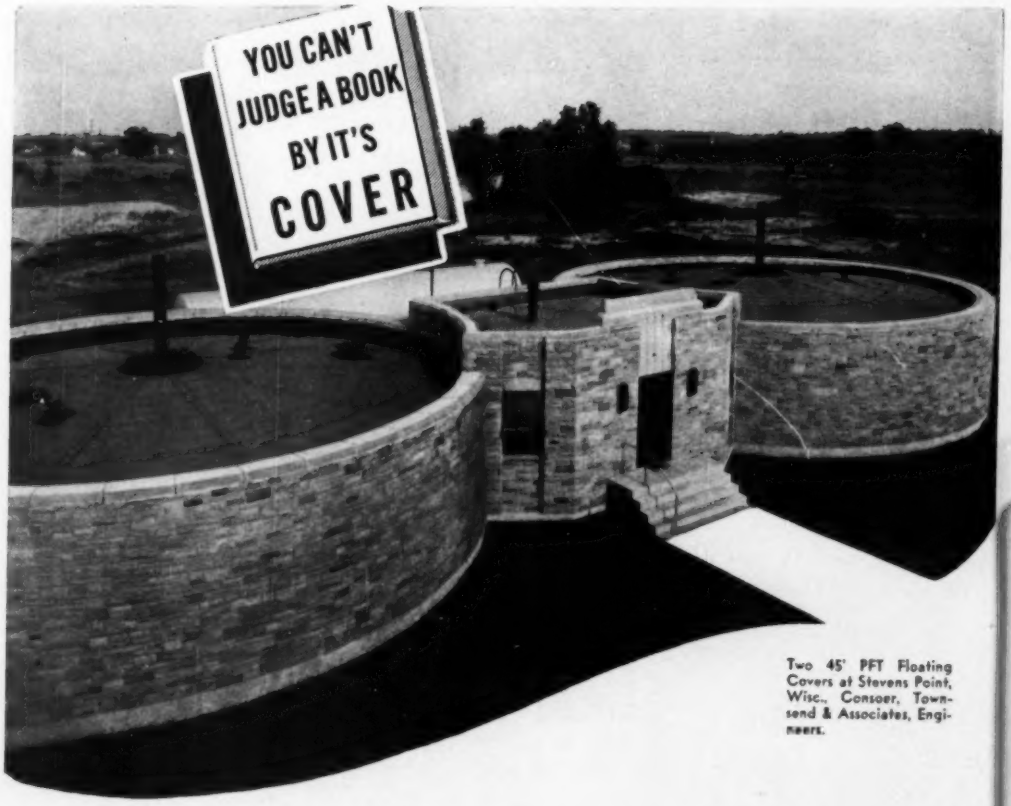
If you don't already know about Everdur, let us tell you about its high strength, durability and how easy it is to fabricate it into lightweight, low-cost wrought assemblies. Just ask for the Everdur booklets. Let our Technical Department counsel you on any special problems or applications. Write to The American Brass Company, Waterbury 88, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

4817D

Where corrosion resistance counts—use Everdur

ANACONDA copper-silicon alloys

*Reg. U. S. Pat. Off.



Two 45' PFT Floating Covers at Stevens Point, Wisc., Consoer, Townsend & Associates, Engineers.

UNLIKE a book, a digester tank is judged by its cover, as well as by what's under the cover. P.F.T. Floating Covers are soundly engineered and constructed to assure a long attention-free, service life. Here again, it's proper design based on long experience, for P.F.T. is pioneer of the floating cover. Literally, hundreds of installations all over the country have given continuous service for years.

P.F.T. Covers provide complete submergence of buoyant sewage solids, effective collection of sewage sludge gas, flexibility through operation either in series or parallel (where more than a single tank is involved) and complete digestion control regardless of what portion tank capacity is employed.

Used in conjunction with a P.F.T. Digester Heater and Heat Exchanger, P.F.T. Supernatant Control Equipment and P.F.T. Gas Safety Equipment, P.F.T. Floating Covers offer the maximum in efficiency and economy for population loadings of 500 to 5 million.

Builders of Digester Heaters and Heat Exchangers, Gas Safety Equipment, Supernatant Liquor Selectors and Gauges, Rotary Distributors, Fixed Nozzle Filter Equipment and Air Diffusion Equipment. Write for Bulletins. Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago 13.

P.F.T. **PACIFIC FLUSH TANK CO.**

SEWAGE TREATMENT EQUIPMENT EXCLUSIVELY SINCE 1893

4241 RAVENSWOOD AVENUE CHICAGO 13, ILLINOIS

NEW YORK • LOS ANGELES • SAN FRANCISCO • CHARLOTTE, N. C. • DENVER • TORONTO

THE SILENT WATCHMAN

DIXIE TANK AND BRIDGE CO.

3523 LAMAR AVE. P. O. BOX 14
MEMPHIS 1, TENNESSEE

Complete Service for Elevated Water Tanks—
Nation Wide Service—30 Years Experience

KEEP THE SAFETY FACTOR IN
YOUR TANK THE DIXIE WAY

By welding seams, pits and rivets which gives a riveted tank 15% more Safety Factor than it had when built. No rivets removed, water supply maintained while work is in progress. On completely reconditioned jobs, the painting is guaranteed for five years, repairs guaranteed for ten years, provided the tank is painted every five years. Yearly inspection, making all adjustments, if any, without additional cost.

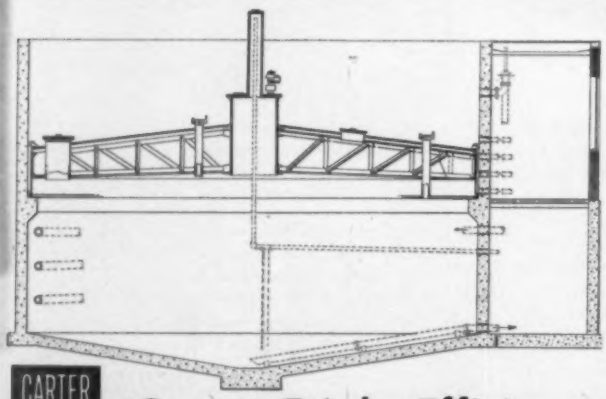
Write Us for Free Copy of Publication

SOUND PRINCIPLES OF WATER TANK MAINTENANCE and TANK TALK, by W. A. RILEY

—SAFETY—SERVICE—SATISFACTION—

COPYRIGHT 1949

THE LARGEST ORGANIZATION OF ITS KIND GIVING SAFE MAINTENANCE AT LOW COST



CARTER FLOATING ROOF DIGESTERS

✓ *Faster, complete digestion*

✓ *Positive, controlled gas collection*

✓ *Reduced maintenance*

CARTER
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Carter Triple Efficiency = Extra Economy

The Carter Floating Roof Digester reflects the latest engineering design and fabricating techniques—all combined to produce more efficient and more economical sewage digestion equipment.
Complete submergence of surface solids; positive, controlled gas collection and utilization; minimum maintenance costs—no mechanical operating equipment; flexibility controls digestion during draw-off, addition of solids or removal of supernatant liquids.

All equipment is stress analyzed, constructed of extra heavy duty ¼" steel plate, pre-assembled during fabrication, and match-marked for easy erection in the field. All appurtenances are Underwriter's Laboratory and Factory Mutual approved. Additional accessories available are supernatant selector, supernatant gage, sight glass and sampler, remote reading liquid level indicator and sludge heating equipment.

186 Atlantic St., Hackensack, N. J.

RALPH B. CARTER COMPANY
HACKENSACK, N. J.

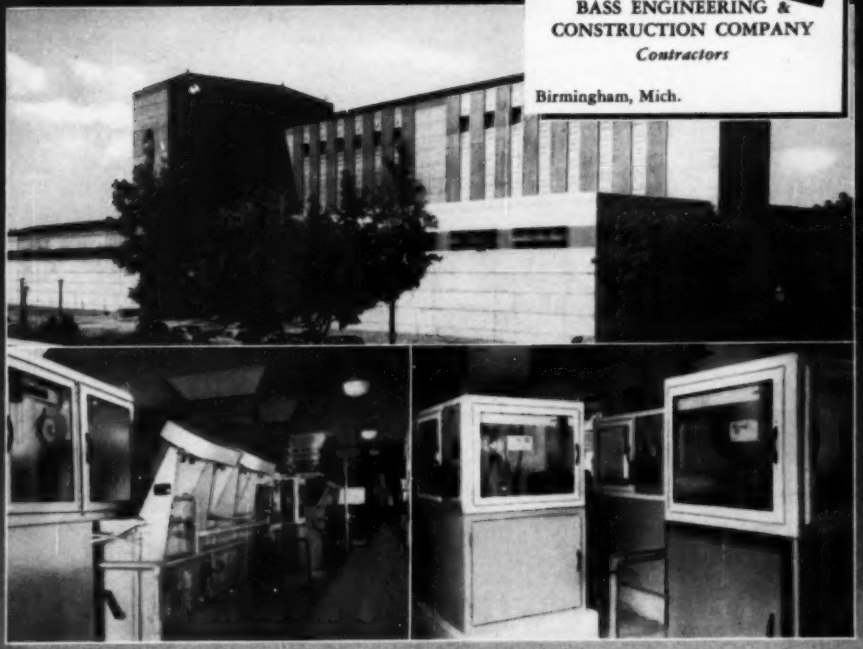
Specify CARTER with confidence . . . .

ROTARY DISTRIBUTORS ● FLOATING & FIXED COVER DIGESTERS
ALTERNATING SIPHONS ● PADDLE AERATORS ● SLUDGE PUMPS
RAPID & SLOW MIXERS ● PNEUMATIC EJECTORS ● CIRCULAR
COLLECTORS ● FLOCCULATION EQUIPMENT ● DIAPHRAGM PUMPS
SELF-PRIMING CENTRIFUGAL PUMPS ● PLUNGER PRESSURE PUMPS

LANSING, MICHIGAN
Water Conditioning Plant
(EXTENSION COMPLETED IN 1949)

ALVORD, BURDICK & HOWSON
Engineering Consultants
Chicago, Ill.

BASS ENGINEERING & CONSTRUCTION COMPANY
Contractors
Birmingham, Mich.



The recently enlarged water conditioning plant at Lansing now has a rated capacity of 40 MGD, almost twice its former output. The original water treating system, built in 1940, proved so successful in providing high quality water that the new extension has been patterned after it. Raw water as it is pumped from the 70 deep wells within the city has an average hardness of 464 p.p.m. The chemical treatment reduces this to 85 p.p.m. and completely eliminates turbidity.

Omega Chemical Feeders and Lime Slakers installed in this efficient plant handle the lime, soda ash and alum required for coagulation, filtration and pH control. Mr. C. R. Erickson, Mechanical Engineer, reports the highly dependable performance of the Omega Feeders, with the lime feeders and slakers consistently accurate within a few tenths of one per cent. For information and Bulletins describing Omega Feeders, address Omega Machine Co. (Division of Builders Iron Foundry), Providence 1, R. I.

Omega equipment furnished the Lansing Water Conditioning Plant extension:

- **3 — Belt-type Gravimetric Feeders with 3000 lbs. capacity lime slakers.**
- **5 — Belt-type Gravimetric Feeders with stainless steel dissolvers and mechanical mixers for feeding soda ash and alum.**
- **1 — Universal Feeder for feeding alum, hydrated lime, soda ash or carbon.**

THE LAST WORD IN FEEDERS
OMEGA

TENNESSEE CORPORATION

Ferri-Floc

FERRIC SULPHATE

Atlanta, Georgia

Results Count!

- MORE ECONOMICAL
- EASIER TO HANDLE
- SUPERIOR RESULTS

The use of Ferri-Floc in water supplies has several advantages over other coagulants now in use. Economy of operation is a great factor in the minds of prospective users, but, once used Ferri-Floc immediately shows its ability to produce a higher quality of water at a lower cost.

ADVANTAGES OF FERRI-FLOC

Coagulation is effective over a much wider pH range than with alum. Color flocs may be formed in the very acid range, where alum may not be employed. On the other hand, true hydrated ferric oxide flocs may be formed at pH 9-10, or even higher for the removal of turbidity and manganese.

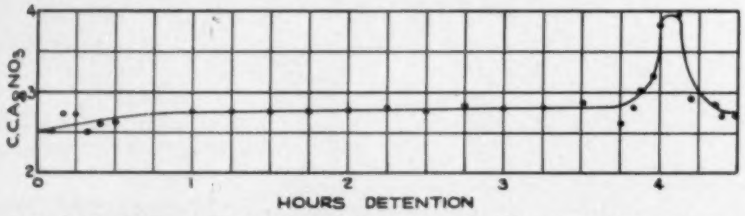
2. *The time required for floc formation, conditioning, and settling is in many cases considerably shorter than that required for other coagulants.*
3. *Filter runs have been markedly increased in several cases.*
4. *Manganese is successfully removed at pH values above 9.*
5. *Effluents may be produced which are exceedingly low in both iron and aluminum.*
6. *Hydrogen sulfide is removed, and taste and odor improved.*
7. *Ferric floc does not seem to stick to sand grains to form mud balls, and is subject to less "breaking through" on the filters.*

FREE BOOKLET — Send card or letter for free booklet on the advantages of Ferri-Floc to Tennessee Corporation, Grant Building, Atlanta, Georgia or Lockland, Ohio.

TENNESSEE CORPORATION

Atlanta, Georgia — Lockland, Ohio

SPIRAFLO SETTLING TANKS PRODUCE EXCELLENT RESULTS



This salt detention curve was obtained from a 39 ft. dia. by 9 ft. S.W.D. primary Spiraflo, when the theoretical detention in the tank amounted to 5.3 hrs. Depth of Spiraflo skirt 7'-4".

Plant No.	% Removals by Spiraflo B.O.D.	% Removals by Spiraflo S.S.	% Removals by entire Plant B.O.D.	% Removals by entire Plant S.S.	Duration of Test
1	56.0				4 mos.
2	47.8	70.	91.7	90.6	8 days
*3	40.7	54.7			8 days
4	57.0		92.0		24 hrs.
**5	55.65	74.6	94.4	91.0	4 mos.
6			96.0		24 hrs.
7	65.0	76.0			6 days

* Heavy proportion of not settleable trade wastes

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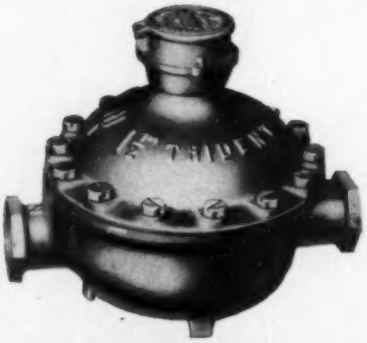

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WATER & SEWAGE WORKS

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A Gillette Publication

WATER SUPPLY & SEWAGE DISPOSAL IN ISRAEL

by

YEHUDA PIETRKOWSKI

Director, Division of Water

ISRAEL MINISTRY OF LABOR

TEL AVIV, ISRAEL

(In Cooperation with Ernest Stock)

THE development of water supply in Israel is closely linked to the history of the young country itself. Where only a few decades ago there was only arid wasteland, a modern country has sprung up almost overnight. In the field of water supply and sewage disposal developments which have taken many years in other countries have had to be brought about in a short time. As a result, much of the growth has been haphazard, taking account only of momentary needs. Only recently has systematic planning gotten underway.

WATER SUPPLY

Water supply in Israel has been progessing through four clearly marked stages. In the initial stage, beginning with the arrival of the first modern settlers at the end of the last century, the mere existence of water in a given place was of primary importance and influenced the development of the surrounding area. In the second stage, the trend was reversed, and the demand for water was created by the development of a given area. In the third phase, the cost of the water became an important factor

Modern Haifa on the Slopes of Mt. Carmel

This is the Jewish Section which set up an unofficial municipal body separate from that of Greater Haifa. To finance sewers, streets and school operation this body sold water at a price five times that paid Mekoroth for it. The water profit scheme was resorted to as the simplest method of securing improvements denied the Jewish Section by Arab-dominated Greater Haifa.

In Israel: "Water is Where You Find It"
Drilling for water in the dry country of the Southern Negev near the Red Sea.

and determined the choice between several possible sources and the best method of development. In the fourth stage, the quality of the water is considered of major importance and suitable treatment is being applied.

Israel is today still going through the second and third stages; the fourth has been reached only in a few isolated instances.

Contrary to widespread belief, there is no acute shortage of water in Israel. The problem is, rather, one of transportation, storage and distribution. The country's yearly precipitation is about the same as that of Western Europe—600 mm. or 23.6 in.—but this rainfall is concentrated within the three or four winter months.

Ground water is the normal source of supply, tapped by deep-bore wells. A well of 100 metres (328 ft.) depth, with a yield of 100 cubic metres per hour (440 gpm.) is the rule in the coastal plain. The water is pumped by Diesel engine or electric motor, either directly to the consumer, (in which case elevated reservoirs serve as standpipes and balancing reservoirs only) or through a rising main into a storage reservoir, from where it is distributed through a separate pipenet to the consumer.

While this supply from deep wells has been sufficient in the past, the continued large-scale immigration is rendering this source inadequate for the large municipalities and extensive irrigation schemes. At the time of writing, Tel Aviv, which started out as a garden suburb, now has close to 300,000 inhabitants. Haifa, the port city in the North, has only 130,000.

Some of the 30-odd wells used in Tel Aviv have already had to be closed down, owing to salt-water infiltration. This particular problem resembles that of some American supplies, where, when too much sweet water was pumped out of underground wells, the sea water came in and made the ground water brackish. Because of the insufficiency of underground water, plans are now being made to use surface water from the Yarkon River, which flows into the sea just North of Tel Aviv.

In Haifa, the supply drawn from shallow wells in the sand dune areas may also become badly vitiated by the intrusion of salt water, and deep-bore wells at the foot of the Carmel Mountain are being used in addition.

In Jerusalem (third largest city with about 100,000 inhabitants on the Israel side) the situation is different altogether. The city is situated on barren hills, 2,500 feet

Israel's First Modern Sewage Treatment Plant
Imhoff Tanks with covered gas vents serve Haifa's Immigrant Housing Project on Haifa Bay.

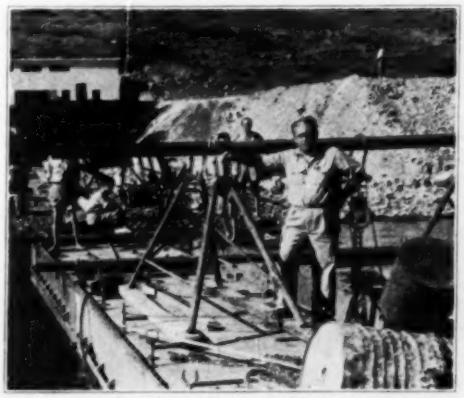
above sea level, and Jerusalem's water must be pumped up from the Jarkon wells over a distance of about 40 miles.

Fifteen smaller towns, with populations of from 5 to 20,000, derive their water from a variety of wells originally destined for, and sometimes still used for, agricultural purposes. This does not make for a satisfactory supply when considered from the economic or sanitary points of view.

The agricultural settlements and smaller villages are generally grouped together under one regional water supply system, in most cases operated by the Mekoroth Company. This organization, owned partly by the Jewish Agency, partly by the General Federation of Labor (Histadrut) and partly by private capital, has been pioneering the development of supplies and distribution of water in the area that is now Israel.

The ground water is very often hard and contains chlorides. Hardness of 400 ppm is not unusual, and in some places water with a chloride content of up to 500 ppm is still considered fit for human consumption. Purification is not necessary in Tel Aviv, Haifa and most smaller towns, except where a clear picture of pollution is present. The latter is the case in Tiberias, which uses the surface water from the Sea of Galilee, and in Acre, where water from an open canal is used. In Tel Aviv, the water is chlorinated as a precautionary measure because the wells are situated within the city area. The water for Jerusalem is treated at the source by the lime and sodium aluminate process of softening.

Pipes used are mostly steel pipes, either socket and spigot or, more recently, with Victaulic, Dresser or other patent joints. To a small degree asbestos-cement and centrifugally cast concrete pipes are used for low pressure. The latter are manufactured locally. Pumps are manufactured locally. Diesel engines are being imported, but electric motors are being made here on a small scale. Water reservoirs and towers are almost invariably of reinforced concrete construction.

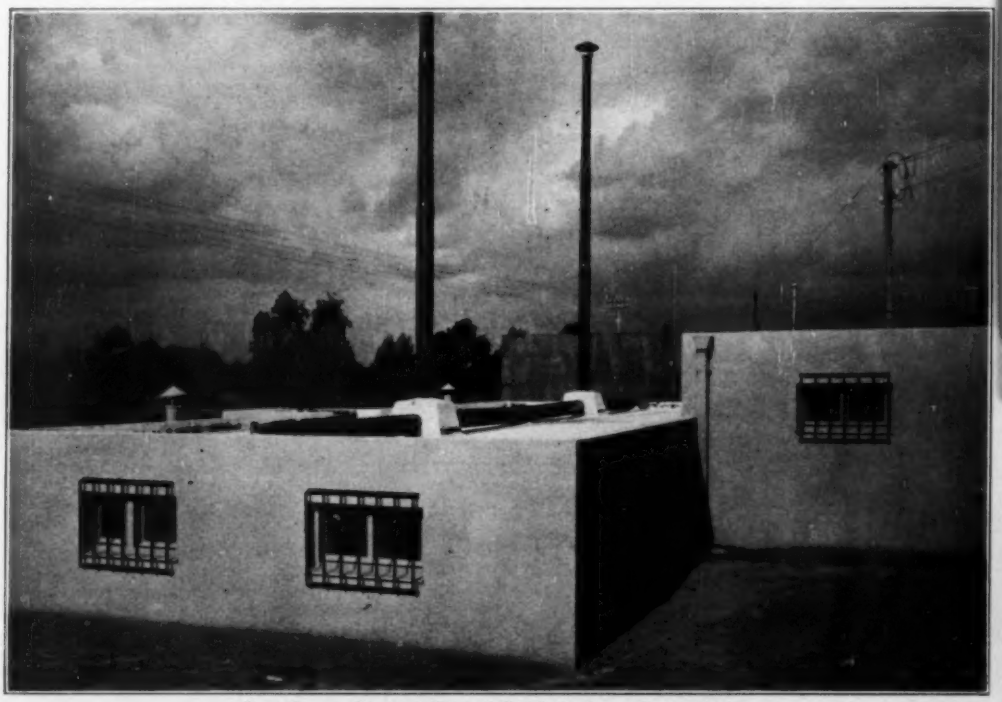


New Water Supply for Tiberias

One of Israel's very few surface supplies. The new plant, with intake pipes being laid into Lake Tiberias. Other surface supplies are being planned because ground water is rapidly becoming inadequate and for the most part is high in hardness.

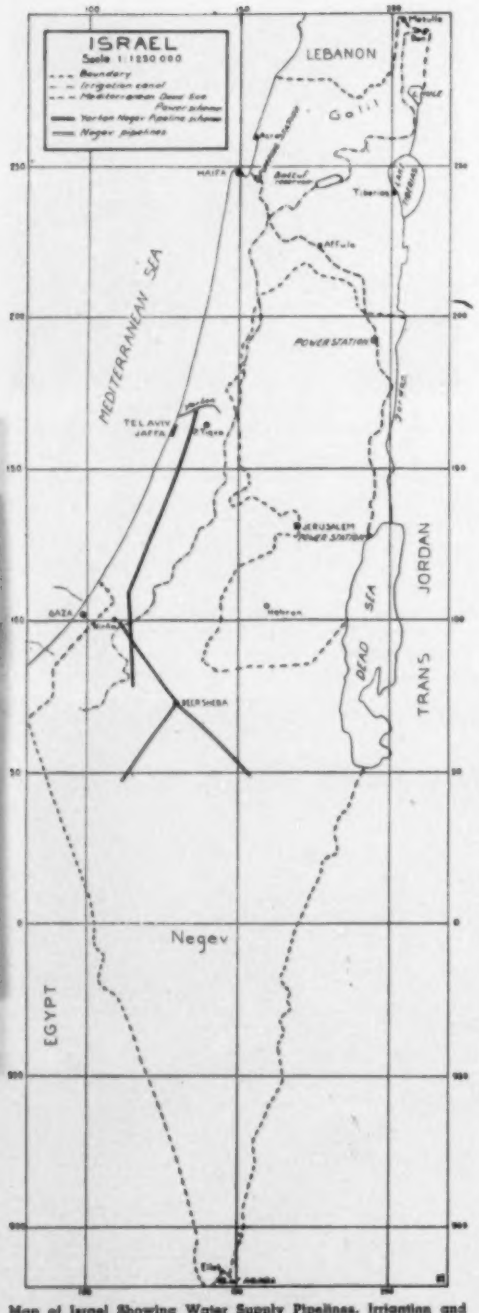
Part Played by the National Government

In most of the cities and towns the water supply is a municipal activity, although some supplies are owned and run by private companies. The National Government does



Novel Sewage Treatment Plant of Haifa's Immigrant Housing Project

Note method of venting of housed Imhoff Tanks.



Map of Israel Showing Water Supply Pipelines, Irrigation and Power Schemes.

not engage in water supply, though the Water Division of the Ministry of Labor and a similar division in the Ministry of Agriculture do the overall planning. Both divisions are headed by water engineers of long experience in Europe. There is, however, a shortage of qualified personnel in this field. Among the recent immigrants, none have a unified, uninterrupted training.

In Jerusalem, the Government—which built the pipeline—sells the water to the municipality, which acts only as retailer or distributing agent. In old Haifa the supply system is still privately owned, partly by Mekoroth, but the municipality is soon expected to take over the supply and amalgamate the various systems. Modern Haifa (the Jewish section built on the slope of Mt. Carmel) is perhaps the only city where for years water supply had to pay for virtually all the municipal services. This was so because the Arab-dominated municipality of Greater Haifa did nothing for the Jewish part of the city. The latter formed an unofficial municipal body of its own (similar to the shadow government of the Jewish population under the British mandate) which built roads, sewers, operated schools, etc., by charging an excessive rate for water. Water was sold at five times the price at which it was obtained from Mekoroth.

This procedure is still in force and will probably remain in force until the municipal organization is revamped after the elections.

Water Sold on Metered Basis as Rule

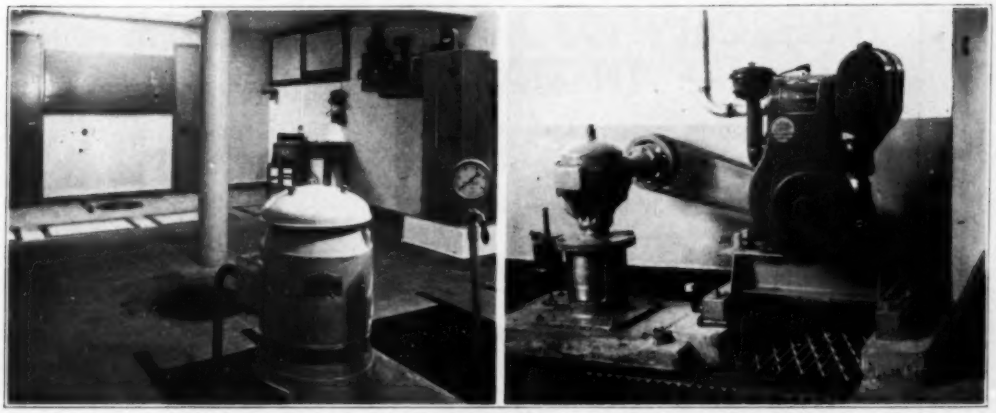
The cost of water in Israel now varies. According to location, the rates are between 20 and 100 mils (6 to 30 cents) per cubic meter or 264 U. S. gallons. The price of power for water supply stands at about 7 mils (2 cents) per kwh.

Water is metered in most parts of the country, with the notable exception of Tel Aviv, where it is charged for on a room basis. This makes for considerable waste, and while it is difficult and costly to change over to meters at this time, it will have to be done in the not too distant future. Some estimates have it that as much as half of the present daily consumption of 90,000 cubic meters (23.8 mgd.) is wasted. Consumption has increased by 17% over last year. So far, only 700 meters have been installed. These are in factories and other places using large quantities. The water is delivered by means of 36 pumps linked up in an underground hydro-pneumatic system and powered by underground plants.

Tel Aviv and other cities financed their water supply systems themselves by means of loans and bond issues. However, there are some areas where the supply will be a losing proposition for a long time to come, and there the Jewish Agency's colonization department stepped in and paid for the installations. In these settlements, water supply is therefore not run on a strictly business basis, and in charging for consumption such factors as interest on loans, sinking funds and depreciation of equipment are not taken into consideration.

One typical such area is the Negev, the semi-desert area to the South. Most of the colonies there now receive their water through an expensive pipe line from Nir Am, near Egyptian-held Gaza (see map). This line was partly destroyed by Egyptian troops during the fighting, but it has since been repaired.

One phase of the Lowdermilk Plan, here called the National Irrigation and Power Scheme, calls for sending water from the springs of the Dan River (one of the Jordan tributaries) in the North and of the Yarkon near Tel Aviv to the Negev by means of a system of canals and pipelines. This part of the plan, along with other parts which can be executed entirely within Israel, are now being worked on by the Government. The core of the plan, the so-called Jordan Valley Authority, is a scheme for sending water from the Mediterranean to the Dead Sea, where it would evaporate. On the way, it would generate power. However, this scheme would need the cooperation



Interior of Modern Sewage Pumping Station at Bat Galin, a Suburb of Haifa
The stand-by pump on right was manufactured in Israel; the engine is of American manufacture.

of Israel's neighbor, Jordan, and its execution is not envisaged right now (see map).

Mr. A. de Leeuw, a former Dutch water engineer and now head of the National Irrigation Scheme (within the Department of Agriculture) recently returned from the U.S., where he arranged for a number of experts, both from government service and from private industry, to come to Israel for short periods to assist in the execution of those parts of the plan which can be implemented. This involves primarily the Yarkon-Negev scheme (see map). Mr. de Leeuw also bought a quantity of equipment for use here, including soil mechanics laboratories, geophysical equipment and exploration boring machinery.

SEWAGE DISPOSAL

As in most young countries, sewage systems and drainage have been lagging way behind water supply, as there is reluctance to invest large sums for this seemingly negative purpose when money is needed everywhere for more spectacular and creative enterprises.

At present only some sections of the major cities have sewage and drainage systems. Because the precipitation is concentrated in four months of the year, sanitary sewage lines are usually separated from the stormwater drainage. In a great many areas, sewage is disposed of by separate cesspits for each house. In Tel Aviv, this method became impossible in the densely populated quarters, since the city draws its drinking water from the wells within the built-up area.

In the construction of a sewage system at Haifa, difficulties were encountered by the absence of sufficient natural fall in the flat coastal plain, and by the high groundwater level. Pumping stations had to be constructed. At Tel Aviv, a tunnel was constructed through the sand dunes.

The sewage of Tel Aviv and Haifa is now discharged into the Mediterranean Sea, but the outlets are very short and this causes pollution of the bathing beach at Tel Aviv and of the harbor at Haifa. Two pipes, manufactured locally of concrete, extend only 100 yards into the sea at Tel Aviv, while the sewage of Haifa is discharged at the root of the breakwater. A length of about half a mile would be appropriate for both places, but the cost, several hundred pounds per yard, has so far been prohibitive.

A London sewage engineer, H. Kaufman, arrived early in January to help solve the sewage disposal problem of the 25,000-acre Greater Tel Aviv area. The suburban towns now dispose of their sewage each in their own way, without coordination between them.

Jerusalem's sewage is still flowing from the Jewish side to the Arab sector of the city, where it is ultimately discharged into a barren valley leading to the Dead Sea.

A scheme is now being studied by the Government to use about 40 million cubic meters of purified Tel Aviv sewage annually for irrigation of a sand-dune stretch south of the city. This follows successful experiments carried out at Kfar Vitkin, between Tel Aviv and Haifa, where apparently unusable and barren sand dunes yielded crops of alfalfa after irrigation. Irrigation experiments with sewage are also being carried on at Jerusalem.

There is no municipal sewage treatment plant in the country at present. The accompanying pictures show a small plant serving the Immigrants' Housing Project near Haifa. It is Israel's first and only modern sewage treatment plant.

ALLEGHENY COUNTY AUTHORITY GETS GOVERNMENT LOAN

An interest free loan of $500,000 has been made by the Housing and Home Finance Agency of the Federal Government to the Allegheny County Sanitary Authority. This is the largest advance approved for a single project since the Advance Planning Program for non-Federal Public Works was reinstated last October. The money was authorized for the preparation of plans for the $59,000,000 intercepting sewer and sewage treatment works for Allegheny County.

The Allegheny County project comprises approximately 54 miles of intercepters and force mains to be laid on stream beds and the sewage treatment plant to be built on the Ohio River below the confluence of the Allegheny and Monongehela Rivers. Construction will be started in 1952. Metcalf and Eddy of Boston have been retained as Consulting Engineers.

In addition to the $500,000 from the HHFA, the City of Pittsburgh has agreed to provide $1,000,000 to bring the plans and engineering studies to completion. Of the original 96 municipalities and 36 industries which joined to form the Authority, the present plan will cover only 59 municipalities and 30 industries.

HISTORY OF WATER METERS IN HALIFAX

by
IRA P. MACNAB,
General Manager
PUBLIC SERVICE COMM.
HALIFAX, NOVA SCOTIA

THE City of Halifax, Nova Scotia, was founded in the year 1749 and incorporated in 1841. Previous to 1844 the citizens obtained all water for domestic purposes from wells. Fire protection was provided by volunteer bucket brigades taking water from the harbour.

In the year 1844 a number of local citizens under the name of the Halifax Water Company, obtained a charter from the legislature of Nova Scotia with a capital of £15,000 for the purpose of supplying water to the citizens. In the same year an amendment to the Act of Incorporation of the City was passed to permit the City Council to make such ordinances as were necessary to furnish the community with public fountains, hydrants and fire plugs and to allow for an assessment on the property in the city to provide an amount of not less than £400 per year to pay the Water Company for such public services and fire protection. From this it is to be noted that even at that time it was recognized that providing fire protection was a service which should be paid for by assessment on the property protected.

In 1845 the population of the city was estimated at just over 20,000 and it was assumed that by 1850 there would be 1500 consumers services and that eventually there might be 2000 services. Allowing 5 persons per service using 40 gallons per person per day it was estimated that 400,000 gallons per day would be required.

Service was first supplied on September 18th, 1848. An interesting feature of the early history of this utility was that in 1849 the directors of the Company authorized a free supply of water from certain hydrants to the poor of the city between the hours of 6 and 7 morning and evening.

During the winter of 1849 the directors of the Company issued instructions to the water users to keep a small stream of water constantly running from their taps to prevent freezing.

Apparently these instructions were only too well carried out for in 1854 many reports of poor pressure were recorded and the Company began to study ways and means to meet the increased demand.

The Author

City Took Over in 1861

In the year 1861 the water works system was purchased by the City. At that time there were 960 customers paying an average rate of £13 per year, £700 was being paid annually for fire protection with special rates being allowed to brewers, distilleries, bakeries and the military.

The history of the Halifax water system from that time on is a most interesting one and is carefully set out in a paper prepared in 1908 by the late H. W. Johnston, C. E. for the Nova Scotia Institute of Science. Mr. Johnston spent many years with the City as Assistant City Engineer and later City Engineer.

From 1861 to just after the turn of the century the history reveals that there was a constant struggle to lay and maintain sufficient transmission line capacity to meet consumer demand. During 1906 Venturi meters were installed on the three transmission mains supplying the City when it was found that 11,370,000 imperial gallons per day were being delivered to the City. At that date the population was about 40,000 and there were just over 7000 service connections which at an average of 5 persons per service gave an average daily per capita consumption of just over 300 imperial gallons.

Metering Began in 1906— Complete by 1920

At that time a program of consumer metering was put into effect and by 1920 the service was 100 per cent metered.

Since January 1st, 1945, the water system of the city has been administered by the Public Service Commission of Halifax and during the last five years a careful survey to see that all meters were properly working has been made, leak surveys have been carried out and a lot of needed maintenance which had accrued over the years has been looked after. The net result of metering has been that as of December 31st, 1949, the Commission has 13,902 service connections and is serving a population of almost 100,000 people (98,719 according to directory estimate), with the same mains which were thought to be inadequate in 1906. During the year 1949 a total of 3,992,000,000 gallons of water were supplied (an average of 10,940,000 gpd) to serve 98,000 people as against 11,370,000 gallons in 1906, to serve 40,000 population.

By the installation of meters there has been no necessity for adding additional capital expenditures in transmission lines capacity. What's more, it is estimated that our existing lines will supply all requirements for some years to come.

Many parts of the water system of this city are now about 100 years old and our leakage is still higher than is considered reasonable. We are still working on this problem, and hoping over the next year to reduce the total input even below the figures of 1949.

Ed. Note: In our next issue Mr. Macnab will discuss water rates in Halifax and methods and procedure employed in developing the new rate schedule recently put into effect.

HEADACHES, HUNCHES AND HARD WORK

Pages from the Life of a Superintendent

*(Fourth Installment)**

by

M'KEAN MAFFITT

Retired Supt. of Water & Sewage Wks.
WILMINGTON, N.C.

The Author
Honorary Member
A.W.W.A.

This is one of a series of "short-stories" by a Water Works Super, who claims that he learned all that he knows about the water works business "the hard way."

We have frequently listened with much pleasure to the philosophy and reasoning of the author, as expressed on the floor of water works meetings and privately. And, we have heard him "preach" a lot of common sense to the younger men and newcomers in the water works business.

SOME eleven months after the new superintendent took charge and I had finished mapping the distribution system, I resigned to accept the position as superintendent in a small southern city. Then my troubles really did begin.

The plant was small, located in the center of the city, deriving its water from deep wells pumped by compressed air. The routine operation had been to fill the 100,000 gallon tank at night, let her stand during the remainder of the night, then start up at 7:00 A.M. But, this did not work. About three days out of each week there was no water in the tank by 7:00 A.M. Of course the people did not greatly object, for they had become accustomed to this bit of inconvenience. Realizing the fact that "old man conflagration" could not be reasoned with, as soon as I got there I started to arrange for two shifts at the pumping station. This to be able to keep the tank full all the time so that the Volunteer Fire Company would have some little chance when dealing with an early morning fire.

My First Experience With a Strike

I arrived in the town on a Monday and immediately took charge of the operations. The following well known Saturday afternoon when the "ghost walked" (as we say down this way) the entire force—engineer, fireman, laborer, street foreman and his gang—notified me that unless they were immediately granted a substantial increase in pay they were quitting the job. Since there was no one else familiar with the plant and its operation, I was left in the well known "hole." But, I told them that they would have to wait until I could study the layout, get a line on their duties and make a study of the financial conditions; that, then I would recommend increases for all those whom I thought deserved it if the finances permitted or additional funds could be arranged. That was not satisfactory—so, they quit. They even voiced the prediction that the plant would have to shut down because there would be no one who could operate it. But, they were wrong. I hired a man temporarily from the railroad shops and a fireman who had once before fired the boilers. I got into my dungarees and we three managed to carry on until I could recruit a crew of men. Of course I had to have one foot in the boiler room, one in the pump room, one in the office and the other one out on the streets doing that which always is necessary in a small plant. But, we managed somehow until we got the new crews worked in. As soon as they managed to get the hang of things I went to bed—not sick, but just to get some much needed "shut-eye."

Leaks, Leaks, and More of the Same

The boilers, I found in terrible shape. We had two 100 HP horizontal return tubular boilers and when first I got there it took both of them to keep the pumps going. Since one or the other had to be shut down and cleaned out once in a while we had to get busy stopping steam leaks, air leaks, and water leaks in sufficient amount to so lower the losses that one boiler would handle the load. I began with the air compressors and the air lift. I knew nothing about air lifts, but using horse sense I figured that stopping leaks in the well line would save more steam, over all, than leakage correction nearer the compressor would. I pulled the air line from the one well that was operative, found that it was full of small holes above the water line, and losing air to beat the band. I placed a different nozzle on the end of the air pipe, renewed the corroded parts, reset the pipe and started up, wondering what I had accomplished. I soon found out. Where the air compressor had had to run at about 150 RPM I could now cut it back to a little over 100 RPM, getting as much water as I needed to carry the load.

Then I figured that the water losses at the end of the line were of more importance than those nearer the boilers, so started on water leaks in the distribution system. Not only on main and service leaks in the street, but on house plumbing leaks, particularly where the houses were without benefit of meter. I managed to cut out about 15,000 gallons of pumpage a day, which by the time it had backed up against the boilers enabled me to shut down one boiler for as much as a week at a time. Then I started on steam leaks. The main steam header was full of pin holes, particularly at threaded connections to fittings, etc. I connected a drip feeder into the main steam header just off from the boilers, and fed through this feeder a stiff solution of lubricating oil and amorphous graphite into the steam header. It certainly was gratifying to be able to sit by and watch a small steam leak suddenly begin to fizzle

*Earlier installments are to be found in issues of March, April and July, 1950.

out. It soon stopped completely, as the sealing graphite was strained out of the steam escaping through the small leaks. Incidentally, some of the graphite got to the steam chests of the engines and so lubricated them that I was enabled to cut down on the graphite-oil feed sufficiently to more than offset the costs of the new arrangement.

A Look at the Records

When I managed to get time enough to look into the office records I found that they were nonexistent, at least for the most part. The maps and blueprints, such as they were, were filed away in the vault and no one knew what they were for. I dug them out and in between times managed to check on the ground to see if what was on the map was really there. Mostly it was, but the maps were so indefinite that you could not tell what they meant. For instance, an engineer (?) had supervised the installation of several miles of new mains. To save money, he had apparently allowed the contractor to run under or over every other crossing or connection. One street in particular had had about ¾ miles of pipe installed in an east and west direction. The north and south streets had mains on every other one. Where the main on this particular street crossed a north and south street one was connected to the old main and at the next one the new main was run either under or over the old main, with no record other than the map. The map, however, showed that all of them were connected. There was no indication, no symbol nor any break under or over to show what had been done. It was a case of "dig and find out." I dug many of them out, but never did I find what system that the engineer used. So, I had to keep on digging. When I left there the condition was none too good, because I had had too little time in the seven years I was there to put to digging out additional information that may have been of value. I risked the danger of having to cut out much larger territories in making repairs or fixing leaks than otherwise would be necessary.

Then I began to look at the records of consumers, billings, etc. The former superintendent was the son of the chairman of the board, so he had run the office as he saw fit. In looking for the larger consumers I could find no record of one in particular. I asked him how he had indexed them and he said that all documents, records were indexed under the first letter of the last word of the title of the concern. For instance all "companies" were listed under C. The Jones Hardware Co., was under C. The Ziggerty Zip Supply Co., was indexed also under C. (Page Commissioner Gildersleeve) so I had a reindexing job.

My First Challenge to a Duel

I hired a lady because of the recommendation of the City Clerk, an old-timer, and put her in the office. For seven months tried to teach her how to do the simplest things necessary. I had to go to the office every night and clear up her day's work. Finally I had to let her go. Immediately her father, an old time southern aristocrat, Major, came to the office and cursed me for all of the things that I was, for a great many that I was not nor could be, branded me as a coward, etc., and challenged me to a duel to the death. Day after day he came to the office and read my titles clear. I never knew just how low down, mean, animalish, stinking a man could get to be until he told me what I was. I soon saw that the challenge had to be done away with or he would die of apoplexy, so I accepted his challenge. Being the challenged party I had the privilege of naming the weapons, so the next day when he came for his "daily dozen" I accepted the challenge and designated my seconds, naming tooth-picks as the weapons to be used with a measured distance of 15 feet between contestants. This finished him, he did manage a laugh but as he left the office he gave me a parting shot as being that "sawed-off, hammered down, cowardly bastard from North Carolina." He was wrong in most of it. I was not sawed off, but I had been hammered down, neither was I born without the benefit of clergy and I had been brought into this vale of hard times in the grand old state of South Carolina.

I Decide to Resign—Then Not to!

After a few years of this kind of treatment by the public and, incidentally, following a slight fight with the Commissioners who would not cooperate with me, but rather obstructed me at every chance, I decided to resign. At the next meeting of the Commission I had my resignation written out ready to hand in. When the meeting was called to order by the chairman, one of the members, who before had been neutral in the many disputes, offered the motion that the superintendent be requested to resign, giving as his reason some silly idea, saying that three days before I had arrived at the office at 10:00 A.M. when I was supposed to get there at 8 o'clock. I explained that since I had worked all the previous night until 6 A.M. I had had the thought that maybe some two hours late would not be taken too much to heart by the Commission, that is if they took enough interest in the plant to know anything about what time I did stop work or what time I came to work. This did not satisfy him, so I took the resignation out of my pocket, showed it to them, then tore it up and dared them to put the motion and make the request. My "Irish" was up and I determined to fight them to the finish. The moving Commissioner then made a second motion. This was, "I move adjournment." The motion carried unanimously. I remained, only to suffer as much or more than I had suffered before.

I Learn Something About Banking Law

The chairman of the Commission was determined to make the job so unpleasant that I would resign anyway. He even went so far as to refuse to sign the checks for payment of accounts, payrolls or anything else. The City Attorney advised me that he had that authority and that the only thing possible to do would be to wait his term expiration, three years later, and vote him out of office. Then I consulted the president of the bank with whom we did business. This was a private bank so he could do some strange things. He did this time. He told me that he would refuse to pay any moneys out unless the checks carried my signature. I learned that such was legal, as the rules of the Department were such that I, as Superintendent, had to sign the checks and the Chairman of the Commission had to counter sign them. He advised me to issue personal checks and simply attach to each the items for which each was drawn and send them along. He said that he would take care of them, and then if it should become necessary he would impound sufficient of the Commission's funds to cover these personal checks. I did not understand the inner workings of such banking, but I had to have money with which to run the plant, so I issued personal checks in the amount necessary, attached a statement revealing what the money was for and he cashed these checks. Even though I had a small personal balance in the bank, I had nothing that even looked as if

it might cover these checks. This arrangement went on for some three months. Each week when the checks were made out for the pay roll I sent the Department check book to the Chairman of the Commission for his signature and each week he sent the book back with the statement that he was not signing checks that day. I have often wondered how he thought that I was carrying on, what I was doing, how the help managed to live etc., but in so far as I know he never found out. Then one day without warning he came to the office, asked for the check book and then signed every check that had been held up. He arose from the chair, walked out of the office without explaining what nor why he had done it. I took the checks to the bank, exchanged them for all of my personal checks and "the water ran on just the same." Incidentally, some time later the Chairman resigned, then the other members of the commission also resigned and we soon had another commission. This was a relief, except that the new commission would not make any effort to enlarge the supply despite the fact that the town was growing and the plant was paying its way and the consumption was running about even with the supply.

Then the citizens voted in a new form of government, the Commission form. A mayor and two commissioners had charge of the whole outfit, water, sewers, streets, finance, fire department and all else. One commissioner was elected to have charge of the physical properties, one of finance and the mayor was in charge of the police and fire department. The new commissioner in charge of the water department was a nice personality, but he was neither an administrator nor a technician. He interfered with the men and I had several run-ins with him. The first was when I had to leave the city for my mother's funeral. While I was gone he ordered the engineer to pump out the underground reservoir built with concrete bottom and side walls. I knew that the ground water level was some 8 feet above the bottom of the reservoir and never allowed the water level to be drawn down much below the ground water level because I did not know, nor could I find out how the bottom was built. I was afraid of the upwards lift of the ground water, fearing that it would burst the bottom of the reservoir. While I was away the commissioner had this pumped out so that he could see just why I was afraid of it. He found out, because when the water level was pumped about six feet below the ground water level the bottom burst up and he was never able to get the water down any further. I was not told of this and when I returned to town I found everything about as usual, only a little more so. Within a few days we had a report of bad water from the State Health Department. Not having a laboratory of our own, we sent all of our samples to the State Laboratory at Columbia for examination and analysis. It had happened that we had had to pump the reservoir down considerably for fire demand a few days before we took the regular sample. A check sample later showed good, so the matter was dropped. Later we found that as long as we kept the water level in the reservoir above the ground water level we never had bad samples; but as soon as we had to lower the reservoir level we found B. coli and other organisms. The conditions were such that we could not make repairs to the bottom of the reservoir, so we decided to install a steel tank of about 1,000,000 gallons capacity above ground. This decision was reached after we had had a sad experience with two 50,000 gallons wooden tanks that had been installed for domestic use, leaving the reservoir in service only for fire protection.

It happened that the consumption was about the same as the capacity of the usable wells. So we started the day if possible with the two wooden tanks full of water, by night fall they were practically empty and we had the night before us to refill them in. I knew that such could not last, that sooner or later we would have a fire that would drain the wooden tanks and force us to use the contaminated ground reservoir. So, in preparation for this I planned the valve layouts necessary to shut off all of the town with the exception of the business section and a couple of outlying industries. Then it happened. A large furniture store caught on fire one morning about 3 o'clock. We started with full tanks and fought fire for four hours. At 7 A.M. I notified the fire chief that unless he could get along with one fire stream we would have to isolate the section in which the fire was and let the rest of the town go without water. He agreed to stop all the use but one stream, which by the way did the job. The fire was quenched, the day started without reserve on hand other than the 100,000 gallons in the stand pipe. By hook and crook and much pleading with the larger consumers we managed to get through the day and still maintain the pressure; but had we had another fire we would have been in a mess for sure.

I Become Acting City Engineer

Some years previously, when the then City Engineer, resigned to go into other and more remunerative fields, I was given the honorary title of Acting City Engineer which was to last only until the Commission could get another man. There was a large pavement job going on at the time, so very foolishly I accepted the title and responsibility without additional pay. This was another mistake. I must have made good because I kept that honorary title for five years, all without additional remuneration. Therefore, the sewer system had now also come under my supervision.

The sewage was disposed of through a septic-tank effect, periodically discharging through, or onto, an intermittent sprinkling filter. There were no plans of the plant and we had to find out the best we could as to how it operated while it was in service. This was some job, since I do not claim now, nor was I then a sewage disposal expert. My particular fort, if any, in this line was in the building and operation of Chick Sale's new moon designs.

The septic tank and filter were under the daily operation of a colored man, who knew only what I could tell him, and this was not much. One day the Commissioner decided to go to the plant and see what he could see. Since in looking into the covered septic tank through one of the 21 man hole cover vents he could not see anything he ordered the operator to drain it out into the swamp. I guess he desired to see the interior mechanism so that he could talk about it in a knowing manner. The operator drew her down. He let the ripe mixture run into the creek and at the same time turned the raw sewage there also. Then after the Commissioner had had a smell and a look into a deep, dark hole he refilled the tank with raw sewage. This of course began to work and generated considerable gas, and lots of hydrogen sulphide.

We Blow-up the Sewage Plant

I did not know what had been done, since the Commissioner had warned the operator not to tell, so, when I decided a couple of days later that it was time to burn off the dead grass around the plant I so ordered the operator. The next

thing I knew the operator was in my office with his eyes sticking out like crab's eyes. They were actually protruding. He was so winded and so scared that he could not talk. I told him to lay down on the floor and get his breath and that then he could tell me what was the matter. He had had a bicycle to ride to and from work, but in this case the bicycle was too slow; he had run the distance from the plant to the office some two miles, so he was exhausted. When he regained consciousness, so to speak, he told me that Mr. S—— had been down there, ordered him to drain the tank, which he had done. Then I had ordered him to burn it off. When the flames reached the cracks around the top of the tank it exploded, throwing the man hole covers high into the air. Had it not been for the vents through these man holes I know not what might have happened. Examination of the tank fortunately showed no particular damage other than the loss of several man hole covers. We found some of them in the fields some 50 to 200 feet away, but three of them were never found. But the odor was terrible. Hydrogen sulphide (H_2S), if you remember, has a very unpleasant odor, in fact it has a nick name that is unmentionable.

This ended the interference of the Commissioner in the affairs of the Department unless and until he had talked the matter over with me and gained my consent.

The Story of Melvin Jones

Melvin Jones was just another colored boy. Ginger snap in color, low receding forehead, flat nose with flaring nostrils, thick roll lips and a hard head. He was industrious, honest to a degree, but he loved to prove his case. When the first world war draft came along he was one of the first ordered up for examination. Melvin took his whole family along with him when he went to the draft office. The examiner asked him, so he told me, "What skimptions (exemptions) have you?"

Melvin pointed to the bench at the side of the office and said, "There they bee, all of them, old woman and three younguns." He was exempted.

In endeavoring to make repairs to the bottom of the ground reservoir we dug a pump well at the side into which we placed a pump suction, hoping that from there we could pump down the ground water to a sufficient amount to allow the concrete, underfloor pad we had placed sufficient time in which to set so that there would be no leaks from upwards pressure. Upon one occasion I had to send Melvin down into the well, which was about five feet in diameter, to make certain adjustments to the end of the suction pipe or to clear it from obstructions. It happened that the horizontal run of the suction pipe was laying on a vitrified paving brick. When he lifted the pipe out of the water to get the trash from the open end it released the pressure of the pipe upon the brick, with the result that the brick fell into the well. The brick landed upon Melvin's head just over the left ear. When I got him out of the well there was a torn place in his scalp, triangular in shape similar to a tear in a piece of cloth. The scalp was open for about two inches on each side of the tear, blood was flowing quite freely, but Melvin said that he was not hurt. I took him to the City Doctor's office for treatment. Upon examination of the wound, the doctor turned to me saying, "For God's sake, what did you hit him with?" When I replied that I had used a paving brick he asked, "Did it hurt the brick?" Melvin came back to work the next morning, but he took the precaution to see that the paving brick had been replaced with a large piece of 2" x 12" timber.

A Raid on Black Cat Alley And a Fire

The pumping station, police station and city jail were at the rear of the City Hall. Communication was had through either of two ways, one a walkway on the east of the City Hall and the other on the west. The jail building, a two-story affair of concrete and steel, faced east onto the open area. The police station, a one story building faced west onto the area, with the pumping station across the north end of the area. At the rear of the City Hall, but on the north side of the walkway was a brick well house in which we had a deepwell pump, with cylinder some 300 ft., down into the well. This pump was a source of constant trouble, but we could not keep up the supply without the small amount of water we got therefrom. One night about 1:30 A.M. we were working on this well, having had to pull the eduction pipe and the cylinder, when the police had raided a den in Black Cat Alley. Among the prisoners brought in was one drunken female who refused to cooperate. She fought like a wildcat, struggled, cursed and spat at every thing in sight. In making a real effort to bring the wildcat in without knocking her out, the police had managed to slightly tear her clothing. In fact she had been practically disrobed with the exception of the collar band of a man's type of shirt which she had been wearing.

We had shut off the water from the entire city in an effort to catch up with the supply through the use of the other well alone. The elevated tank was full, being held in reserve for fire fighting. The plant was operating with the exception of the high lift pumps. After the experience of watching the policemen bring in the drunken woman the excitement had barely died down when someone called me and yelled, "Look yonder Boss, there's a big fire". I looked where he pointed and there in fact was a big fire. The flames were jumping some 12 feet high out of the window of a two story store building about one half city block away.

I gave the order that had been arranged, one man started to open the valve on the elevated tank, another opened a fire hydrant to relieve air pressure, while the rest of us went to the fire. We arrived there before the fire apparatus did, but it got there within the minute after we did.

The proprietress of a rooming house that was over the store was a type of person who is generally known as a termagant. She was extremely wild, rough and given to certain profanity. Since her apartment was on fire and since there had been a slight delay in getting a stream of water playing on the fire she was cursing all and severally for being different kinds of sos-and-sos. I requested the firemen who had the nozzle to point it directly at her, knowing that within a few seconds there would be a good stream of water flowing. The lady was dressed in her nightie, a light cotton affair that clung closely when wet. When that water hit her she gulped a time or two and started to run, but she had no where to run to. Her house was on fire, no place was open but the streets. So she ran down the street almost as nude as the lady who had just been carried to the cooler. The fire was soon extinguished, the termagant returned to her partially burned apartments, we went back to the well and finished the repairs just in time to eat a good breakfast and report for work at 8 A.M.

In the meantime my notice of separation had about expired, so the middle of the next week I left for a new and large position.

AN ASBESTOS-CEMENT PIPE SEWER SYSTEM COMPLETE

by

ED. and JOE WILLIAMSON, JR.,*
RUSSELL AND AXON ENGINEERS
DAYTONA BEACH, FLA.

LATE in 1945 the town of Macclenny, Florida, took advantage of FWA planning funds to design a complete sewer system and treatment plant. At that time, due to the difficulty in obtaining materials, it was decided to postpone construction of this system until a more favorable time. Interest crystallized on the proposed installation in 1948, at which time Russell & Axon, Consulting Engineers, were authorized to proceed with the project. The town officials, having become interested in the potentialities of asbestos-cement sewer pipe under Macclenny conditions, requested the engineers to consider its inclusion in their plans for the entire system, including the house connections. The redesign of the system and subsequent construction experiences have proved the desirability of asbestos-cement pipe under the observed local conditions at Macclenny.

Macclenny is a small town of 1,200 population, located about 30 miles west of Jacksonville. It has exceptionally flat topography, the maximum and minimum elevation within the city limits varying only 7 feet. The maximum distance from the upper end of the sewer system to the plant is about 7,400 feet. The sewage is entirely domestic.

*Engineer and Vice-President, respectively.

Typical Unsheeted Trench

Construction economy made possible through use of smooth bore cement-asbestos pipe. Trench depth reduced from 20 ft. maximum in original design to 12 ft., resulting in sheeting elimination, saving of well-point dewatering expense, and elimination of $15,000 pumping station.

High Ground Water Table Poses Problems

The field conditions observed, together with certain factors brought out in the redesign, gave convincing evidence that asbestos-cement pipe offered certain distinctive advantages for this installation. First, it was desirable to keep cuts to a minimum depth, as the high water table and other sub-surface conditions would make the costs of deep cuts prohibitive. The original observations indicated that water could be expected at an average trench depth of three feet even during the dry season.

Also, it was found that for the most part an impervious clay stratum, acting as an artificial water table during dry weather, occurred at a depth of 2 to 4 feet. When this clay was cut, the sandy earth overlying it actually flowed into the lower ditch. Under the clay, other unstable formations were found, and also a second water table. Even with these most unfavor-

Method of Attaching C.I. Cut-ins

Drilling 8" A-C. pipe for 6" house connections.

A-C House Connection Riser

About 90% of street mains lie in ground water.

A Braced Trench

Loblolly mud flowed in, necessitating fast installation.

Some Typical Trenching Conditions

At depths of 2 to 4 ft. an impervious clay stratum acted as an artificial water table. Sandy soil sloughed off into the trenches, adding to wet trench conditions.

able conditions the entire job was completed without use of well points. Such dewatering as was necessary proved practical of accomplishment by means of a small pump. A considerable portion of the total project was obviously laid in wet ditches.

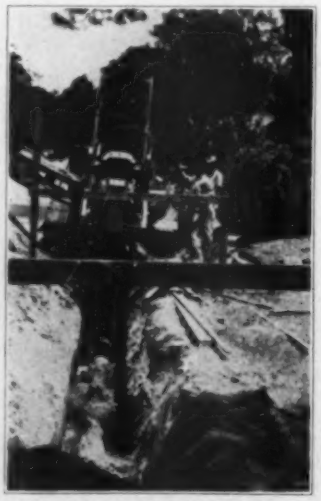
Trench Depths Reduced—Infiltration Negligible

Insofar as design factors were concerned, asbestos-cement sewer pipe, with its low coefficient (n=0.010), permitted the minimum cut. The maximum cut was held to 10-12 feet, and this for a distance of less than 1,200 feet. This compares with cuts 18 to 20 feet in a design using other materials. Eighty-one percent of the entire system was held above the 8 foot level. About 90% of the pipe was laid below the water table. The accompanying pictures show the conditions encountered.

A second advantage, expected and realized, is that the seal joints of the asbestos-cement pipe allowed a minimum of infiltration. In the engineers' previous experience, in several installations of limited extent, it was found that not only did asbestos-cement pipe's infiltration meet our usual specifications, but that, actually, infiltration was almost completely eliminated. Obviously, this was a highly important feature at Macclenny, with its year-around high-water conditions. The final test for infiltration of the whole system did not exceed 4 gpm—and actually, this infiltration could be traced to the manholes. Several of the worst sections of the sewer, in which the water table stood 3 to 4 feet above the pipe during construction, were blocked off and tested for infiltration. No indication of infiltration could be found.

Effects of Reduced Infiltration on Design

In the design of the system, an allowance of 50 gal/capita/day was made for infiltration. This is the degree of infiltration allowed in State Board of Health standards for sewers constructed of other materials. In future work, involving the use of asbestos-cement sewer pipe, the design allowance for infiltration can certainly be reduced materially. This would result in the need for smaller treatment plant units, smaller pipes in a large system, and reduced pumping costs, the latter being affected from the point of view of both capital and operating costs. In the Macclenny project, lesser infiltration will result in longer plant life, as the actual design capacity of the sedimentation basins will not be reached until many years after the period for which the original design capacity was based.



Pipe Laying Kept Up With Trencher

Such was a necessity when confronted with flooded trench and sloughing side-walls.

$15,000 Lift Station Eliminated

One other economically important feature of this system is that with the lower "n" value made possible, and its resulting shallower cuts, a lift station was eliminated. This resulted in a savings estimated at about $15,000, which was applied to further lateral extensions. A greater proportion of the town's population, therefore, received the benefits of the new sewer system. Also, because sewer service charges will be used to help finance the project, a greater number of customers will share the expense; and, at the same time, operation and maintenance costs are reduced as the result of elimination of a pumping operation.

Installation Costs Reduced

In the original study of asbestos-cement pipe, the cost of the material itself was, of course, given thorough consideration. It was brought out that the material cost of this pipe is higher

than for other materials. However, our previous experience, as well as quotations from various contractors, indicated that the overall installed cost would be equalized. This equalization is brought about by several factors, namely: minimum trench; elimination of extra allowance for joint materials; fewer joints to make, with consequent lower labor costs; greater installation speed; and greater ease of laying under very unfavorable conditions. As a matter of fact, the placing of other materials would have been impossible, or prohibitive in cost, under the conditions encountered.

One other factor resulting in economy was the reduction in the cost of trench sheeting. It is estimated that several thousands of dollars were saved not only in the elimination of sheeting due to reduced depth of trench, but, also, in the elimination of sheeting as the result of the speed of assembly of the pipe.

It should be observed here that this entire project was completed under city force account, since one of the requirements laid down by the city officials was that local labor be used entirely.

Improvised Tools Speed Assembly

As the installation progressed it was found that the coupling-jack received for assembling the pre-poured, tapered couplings left something to be desired. Most of the job was completed under high temperature conditions (90°-100°F.), causing the jointing compound to soften. The laborers usually applied too much pressure with the jack, resulting in some of the jointing compound being forced into the pipe. On drying, this compound formed a hard collar which would have obstructed the flow. Fortunately, this was discovered early and another method adopted. A steel pry bar and a wood block were then used to force the sections together. This was found also to be much faster than the jack. Caps were provided for the end of each section to prevent mud and water from entering. The tapered pipe ends with their factory-inserted asphaltic liners were primed with solvent before the pipe was placed in the excavation..

"The End of the Line"

This trickle from the 10" line at the treatment plant location represents the total infiltration for the entire system of almost 7 miles of asbestos-cement pipe.

Method of Jointing A-C Pipe

Tapered pipe ends are forced into the coupling. Couplings have asphaltic liners and pipe ends are pre-primed at the factory.

It is to be noted that this was an all-asbestos-cement project, for the house connections, too, were of that material. These were stubbed in, immediately following the sewer-laying crews, as far as the property lines. As a matter of fact, the infiltration tests referred to were made with these stub-ins included. From the street sewer to the property line 6" pipe was used; from there to the house 4" pipe was used.

The utilization of asbestos-cement pipe on this project was made possible through the farsighted and progressive attitude of Mr. W. F. Wells, City Manager, and the City Council of Maccleny who originally approved the study of this material. Mr. W. B. Gribble was resident engineer and is responsible for the entire supervision of construction, finally bringing the project to its successful conclusion. Mr. Norman Bullock of the Johns-Manville Corporation instructed in the laying of the pipe. Design was under the direction of J. F. Kapinos, Chief Designer for Russell & Axon, Consulting Engineers. Mr. R. A. Graves was the city's Superintendent of Construction.

Some Future Considerations

Summarizing, it is the belief of the engineers that asbestos-cement sewer pipe can be installed for a cost equal to, or less than, that of other materials. With proper installation, infiltration is essentially eliminated. Accordingly, smaller allowance for infiltration should be made when designing. As a result of lessened infiltration, the hydraulic design factors of treatment units and lift stations can be reduced, with a consequent reduction in both capital and operating costs.

Corrective for Brittle Ice

Also Tougher and Longer Lasting Ice

A patent has been granted Jagan N. Sharma of Los Angeles covering a method for producing tougher (less brittle) ice cakes which has a longer life than ordinary ice. The patent is No. 2,509,579.

The method consists of adding a minute quantity of certain types of organic compounds to ordinary water from the city mains. One of these compounds is fluorescein.

The result is a tougher ice which does not shatter and melts from 7 to 16% more slowly than ordinary ice. The improved ice has been used in cross continent refrigerator cars without the need for re-icing, in contrast to the usual necessity of three re-icings en route from coast to coast.

This information is being published for the benefit of our readers who may be called upon by ice manufacturers to help solve their brittle ice problems, often charged to the water quality by the ice producers.

Extravagance vs Obsolescence

Some have an idea that the reason we in this country discard things so readily is because we have so much. The facts are exactly opposite—the reason we have so much is simply because we discard things so readily. We replace the old in return for something that will serve us better.

Alfred P. Sloan, Jr.

Bernal Swab Joins Blundon, Snyder and Small

Bernal H. Swab, consulting engineer has joined the firm of Blundon, Snyder and Small of Keyser, W. Va. Mr. Swab has been associated heretofore with the firm of Jones, Henry, and Schoonamaker, of Toledo, Ohio. He is well known to the water works profession, not only for his engineering ability but also as the man who takes movies at the AWWA Conventions.

In his new connection Mr. Swab will handle all of the sanitary engineering work of the firm, which has specialized in rate cases. He joined the West Virginia firm on the first of August.

AWWA PURIFICATION DIVISION

A Report

by

HARRY A. FABER*

Editorial Associate
WATER & SEWAGE WORKS

DURING the 70th Annual Conference of the AWWA, the Water Purification Division held three technical sessions and one joint session with the Water Resources Division. Attendance was generally at capacity and members participated enthusiastically in discussions. There is every evidence that the healthy condition of this division will continue under the newly elected officers: Chairman H. E. Lordley, Vice-Chairman H. O. Hartung, and Secretary R. L. Derby.

Committee Reports

A. P. Black
Head
Dept. of Chem.
Univ. of Fla.
Gainesville, Fla.

J. E. Kerslake
Supt.
Filtration
Water Works
Milwaukee, Wis.

Committee Reports

The first session was devoted to five committee reports and to an open discussion of the future plans of the division. Past Chairman A. P. BLACK presided at this session.

"SPECIFICATION TESTS FOR WATER PURIFICATION CHEMICALS" were reported by Committee Chairman J. E. Kerslake, Supt. of Filtration, Water Works, Milwaukee, Wis.

Mr. Kerslake credited M. M. Braidech with the original development of specification tests and the late C. K. Calvert with their revision. Work of the present committee has been extended, and eleven different chemicals are now included. The cooperation of large chemical users and chemical manufacturers is needed for referee purposes. The specifications are gradually being published in tentative form in the AWWA Journal. After criticisms are received permanent standards will be prepared—a step not now too distant.

"PRACTICAL LOADING CAPACITIES OF WATER TREATMENT PLANTS" were reported by Committee Chairman H. O. Hartung, Plant Engineer, St. Louis County Water Company, St. Louis, Mo.

Mr. Hartung presented a comprehensive report on suspended solids contact type basins. This included an historical review of the development of these types of basins—given in summary only because of the extensive report recently published in WATER & SEWAGE WORKS ("The Sludge Blanket Clarifier," by Frank D. Prager, April 1950).

Suspended solids contact type basins are, according to Mr. Hartung, offered by eight different manufacturers at the present time. He showed lantern slides to illustrate the characteristics of each type. A survey of installations reveals a variety of pertinent operating data. The degree of stability accomplished (when these basins are used for water softening reactions) is at least equal to that in conventional basins.

Among items of operating experience reported to the committee: There is almost no agreement on the effect, beneficial or otherwise, of previously precipitated floc in reactions. Detention times required range from 1 to 3.5 hours—operators find time should be lengthened when higher temperatures prevail. The amount of waste water characteristic of these units is comparable to that of conventional units. Varying amounts of slurry have a varying effect on turbidity removal, which differs in softening or non-softening reactions. Experience in the effect these units have in changing the concentration of taste and odor, and chlorine demand, appears to be both beneficial and otherwise. Short interruptions in chemical feed do not seriously affect the efficiency of suspended solids contact type basins.

Final review of this report will be made by consulting engineers and by State Dept. of Health Engineers. The data presented will be of particular value because information is correlated and summarized.

"WATER CONDITIONING METHODS TO INHIBIT CORROSION" were reported by Committee Chairman K. W. Brown, Brown and Caldwell, San Francisco, Calif.

This committee has recently been reorganized to include a member from each AWWA Section, and to present a coordinated report rather than to make a collective study.

The former committee reported, in 1942, on a study of hexametaphosphate; the present committee is concerned with protective coatings, chemical and bacteriological inhibitors, and electrolytic methods. No accelerated test procedures have been found, and

Committee Reports

H. O. Hartung
Plant Engr.
St. Louis Co.
Water Co.
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N. J. Howard
Director
Water Purif.
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solution of the problem requires coordinated studies to prevent duplication, the publication of reports, and cooperation with similar committees of other associations.

"OPEN-AIR RESERVOIRS" were reported upon by Committee Chairman N. J. Howard, Dir. of Water Purif., Filtration Plant, Toronto, Ont.

While this committee has functioned for three years, Mr. Howard noted that its report has not yet been published because the recommendations made therein are considered too drastic. Replies to questionnaires have been received from 95 per cent of engineers heading State and Provincial Health Departments. Engineers and chemists in other than this category have recently been questioned, but replies have been received to date from only 15 of the 40 addressed. Particular reference was made by Mr. Howard to the recommendation of the committee that all new and existing open service reservoirs be covered—the term "urgent" is considered justified.

*Research Chemist, The Chlorine Institute, Inc., New York City.

The discussion which followed indicated this subject to be one of considerable concern. C. R. Cox, New York State Dept. Health, summarized an attitude which is probably general: If the AWWA develops the report of this committee as a statement of policy, it can be of great value; if it is developed as a standard specification, the results may be disastrous. He pointed to the need for ideal practices —which may not, and should not, become official requirements. The question is: how can this committee report serve as a guide to practice and yet, if published, not be misused?

R. J. FAUST, Michigan State Dept. of Health, noted that his State will not approve the construction of open service reservoirs, but that certain other State Health Departments will do so. It is difficult to make specific recommendations under such conditions, even though problems of water deterioration are generally recognized.

Programmers

R. L. Derby
Prin. San. Engr.
Los Angeles, Calif.

G. D. Norcom
Consultant
Red Bank, N.J.

R. L. DERBY, Dept. of Water and Power, Los Angeles, Calif., pointed out the practical considerations involved. He described one large open reservoir being constructed by the city of Los Angeles—it is a service reservoir but cannot economically be covered; instead terminal chlorination will be provided for protection. Small service reservoirs constitute an entirely different problem.

E. A. REINKE, California State Health Dept., cautioned that, from a State Health Department standpoint, any action taken must be reasonable in order to be useful. He decried inflexible codes and rules as executed by insufficiently trained personnel and urged that the Water Purification Division should recommend reasonably flexible and enforceable standards.

"STANDARD METHODS FOR THE EXAMINATION OF WATER AND SEWAGE" were reported upon by Committee Chairman R. L. Derby, Prin. San. Engr., Dept. of Water and Power, Los Angeles, Calif.

Mr. Derby reported that his committee had developed its plan to form sub-committees to review and recommend new methods of chemical analyses where needed. He reviewed various tests not now included in "Standard Methods" and others in need of revision. The effect of residual chlorine on colorimetric determinations is one such method being investigated.

Research on methods is a large field, but investigators willing to undertake studies are few indeed. Mr. Derby expressed the desire of his committee to find qualified technical personnel and laboratories to cooperate — and promptly—in the work of this committee.

Future Plans of Division

"FUTURE PLANS OF THE WATER PURIFICATION DIVISION" was the title of a panel discussion comprising the last, and all too brief (for lack of adequate time) part of the first session.

C. R. Cox, Chief, Bureau of Water Supply, Div. of Sanitation, State Dept. of Health, Albany, N. Y., spoke enthusiastically of the value of contributions made by committees. Members of the Division should be encouraged to devote more time to such work. He recognized that the majority have only limited time available, and suggested a referee should be appointed to present a study of certain problems for committee consideration (rather than having the entire committee develop a study). As another suggestion, he recommended that the officers of the Division could better integrate its interests with those of related groups.

Mr. Cox noted his impression that research in water purification does not appear to be as extensive as that underway in the sewage treatment field. He proposed that a brief summuary be presented at each meeting of the Division to review developments of the preceding year. He pointed out that water pollution control programs are absorbing disproportionate funds in relation to those available for water purification studies. The Division should advance studies relating to water purification problems.

R. C. BARDWELL, Supt., Water Supply, Chesapeake and Ohio Railroad Co., Richmond, Va., recommended that the division should give increasing attention to the special needs of industrial consumers of water.

N. J. HOWARD, Dir. of Water Purif., Toronto, Ont., considered the opportunity for discussion at division meetings to be inadequate. He suggested that more advantage be taken of the symposium type of presentation.

ROLF ELIASSEN, Prof. Sanitary Eng., Mass. Institute of Technology, Cambridge, Mass., commented on the cost of research. In the study of corrosion, funds are solicited from manufacturers primarily concerned with this problem, and he considers that the same procedure may be successful for attack on other research developments.

PANEL DISCUSSIONS

Small Treatment Plant Problems

Retiring Division Chairman J. E. KERSLAKE, chemist, Milwaukee Water Works, presided at the second session, at which two panel discussions and two technical papers were presented.

"OPERATING CONTROL OF SMALL TREAMENT PLANTS" was the title of the first panel discussion. L. D. Matter, Asst. Chief Engr., State Dept. of Health, Harrisburg, Pa., was the Moderator.

R. G. YAXLEY, Supt. of Water, Waterford, N. Y., on the basis of his experience, has a variety of ideas to present. Many small treatment plants are old; they include poor features of

Programmers

C. R. Cox
Chief
Bur. of Wat.
State H'lth Dept.
Albany, N.Y.

R. J. Faust
Chief
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Lansing, Mich.

design and poor equipment. Mr. Yaxley emphasized that engineers designing small plants should sell an especially good job—which, obviously, cannot mean a cheap one. Personnel in small plants must be qualified for varied jobs. Licensing may help the operator keep his job, but will not tell him how to do it. He believes a water commission type of management and a consulting laboratory are especially helpful to small plant operators.

FRANCIS GOSNELL, Operating Mgr., Municipal Water Works, Laurel, Md., pointed out that the majority of small plants have developed progressively, but without a satisfactory over-all plan. He listed the problems involved in such growth. Like his plant, many others are forced to operate far above their design capacity. The ability to do so safely, and produce a satisfactory water, depends almost entirely on the abilities of the plant operator. He recommended that small plants should be built with the best of engineering service to provide, as nearly as possible, a fool-proof plant. The cost of

water should be based on a fair charge, and the manager of the utility should be adequately rewarded.

C. R. RIDDINGTON, Supt. Lansdale Munic. Authority, Lansdale, Pa., described changes in the ownership of this small plant: first as a private utility, then under absentee ownership, and then municipal control. There are 17 wells maintained for use, and 11 chlorinating units treat water directly ahead of pumping to the distribution system. Mr. Riddington considers it inconceivable that any small system can be well operated without the use of, or at least the availability of, expert technical consultants.

J. H. BARTHOLOMEW, Mgr. Atlantic County Water Co., Pleasantville, N. J., noted that his supply is one of 117 plants supervised by a water service company. Regular and emergency technical services, and services of non-technical nature are provided. Two sources of supply are employed—surface and ground waters—and each has special problems best met by the wide experience of the supervisory staff. Mr. Bartholomew gave as his opinion the need for local personnel in plant operation with the concommitant need for ready access to expert advice.

Small Plant Problems

L. D. Matter
Asst. Ch. Engr.
State H'lth. Dept.
Harrisburg, Pa.

R. G. Yaxley
Supt.
Water Comm.
Waterford, N.Y.

MR. MATTER reviewed and summarized the variety of experience reported by these operators of small plants in New York, Maryland, Pennsylvania, and New Jersey: Many small municipalities are either unwilling or unable to build adequate treatment plants: accordingly it may be necessary for the operator to be a "jack-of-all-trades" to provide good operation. But good plants are seriously needed—so are adequate salaries, good records of operation, and the opportunity for the operators to exchange ideas. There is general agreement on the need for expert consultants to assist in solving the more difficult technical problems.

In subsequent discussion, Mr. Yaxley emphasized the extensive assistance provided by engineers of state health departments. Mr. Riddington stated a good employee in a small plant must not mind long working hours. D. B. WILLIAMS, Supt., Brantford, Ont., commented on the value of laboratory facilities in small plants for continuous control tests. I. M. GLACE, Consultant, Harrisburg, Pa., pointed out that small water treatment plants are of great importance to the AWWA, and that discussion of the problems of these plants should be a regular feature of Purification Division meetings.

Fluoridation

"EXPERIENCES IN ADDITION OF FLUORIDES TO DRINKING WATER" was the title of the second panel discussion at this session.

One paper was presented by L. A. SMITH, Supt. of Water Works, Madison, Wisc. Mr. Smith noted the special reasons for the use of hydrofluoric acid at Madison, and described the equipment employed. The original installation has been described in detail in WATER & SEWAGE WORKS (April, 1949, page 125). Installations have now been completed at all the separate wells, and the entire supply is treated. Because nine separate units are required, the cost of treatment at Madison (about 20 cents per capita per year) is somewhat higher than for the average municipal supply.

The second paper was presented by J. C. ZUFELT, Supt., Board of Water Commrs., Sheyboygan, Wisc. Mr. Zufelt discussed the program which has been underway for four years in his city; particular attention has been given in this installation to tests in the plant to insure adequate safety factors for operators. The State Health Dept. and Sheboygan City health officials have made annual surveys to determine the effectiveness of the fluoridation program. The rates of DMF teeth (decayed, missing, and filled teeth) among kindergarten children were 4.8 in 1945 and were reduced to 2.9 in 1949. These studies will be continued. This city is the first to make a plant scale investigation of the use of sodium silicofluoride as a substitute for sodium fluoride. The details are given in Mr. Zufelt's article in WATER & SEWAGE WORKS (page 229, June, 1950).

In open discussion of these papers, C. R. Cox stated the experimental study in Newburg and Kingston, N. Y., has already demonstrated a 30 per cent reduction in DMF rates to be accomplished in low age groups, and give evidence that a 60 per cent improvement may be expected by the fluoridation program after 8 to 10 years. The New York State Dept. Health finds the results so convincing that it is now willing to approve empirical installations where proper equipment and supervision is available.

Prevent Iron Settlement

"PREVENTION OF SETTLEMENT OF IRON" by C. R. Henry, Chief Chemist, Dept. of Water and Sewers, City of Miami, Fla.

Mr. Henry reported a silica sol was found to be more effective than sodium silicate in preventing red water. This laboratory study included an investigation of sodium phosphates, fluoride ion, and three polyphosphates—none of which proved suitable for red water prevention in the local water and for local conditions.

The City of Miami was unable to produce enough treated water during the past winter season. New wells were available, but a proposed treatment plant was not; and the water demand was in excess of the output of the Hileah water treatment plant. For nearly two months one well was operated at a 7 mgd rate, 16 hours per day, the water being treated with chlorine and sodium silicate. The chlorination alone would precipitate iron naturally present in the water, but 15 ppm. of SiO_2 applied in the form of sodium silicate proved a satisfactory preventive treatment. Laboratory examination of samples, and the absence of consumer complaints, both demonstrated the success of preventing local red water conditions. Activated silica was not used in practice (though the sol might have been even more effective than the silicate) because no practical facilities for feeding the sol could be provided quickly.

Fluoridation

Leon A. Smith
Supt.
Wat. & Sew. Wks.
Madison, Wis.

J. C. Zufelt
Supt.
Bd. Wat. Comm.
Sheboygan, Wis.

Hardness Titration

"FURTHER STUDIES OF COLORIMETRIC HARDNESS TITRATION" by J. D. Betz, W. H. and L. D. Betz, Philadelphia, Pa.

With the use of excellent color slides, Mr. Betz illustrated the technique of the new hardness and calcium tests which employ colorimetric titration. The old soap test actually measures the soap consuming power of hardness contributing ions without re-

producible accuracy. In investigations of the new colorimetric test, the Betz laboratory has studied more than 30,000 water samples, and has found that the problems encountered are largely those due to the extreme accuracy of the colorimetric test.

For example, water hardness was found to increase during filtration through filter paper; the solution developed is to discard the first 200 ml. of 300 ml. filtered. Water hardness was found to increase upon storage of water samples in glass bottles; the increase is less in Pyrex than in soda-lime bottles, and less at high pH than at low pH values. Accuracy of the test makes it more widely useful in better operation of zeolite softeners and in detection of condenser leakage.

High Filtration Rates

"FURTHER STUDIES OF HIGH FILTRATION RATES" by J. R. Baylis,

Pollution Problems

H. A. Faber
Res. Chem.
Chlorine Inst.
New York City

L. L. Hedgepeth
Consultant
Amer. Cyanamid
Bound Brook, N.J.

Engr. of Water Purif., Bureau of Eng., Chicago, Ill.

Presenting a summary of his studies on high filtration rates (varying from 2 to 5 gallons per square foot per minute) Mr. Baylis called particular attention to washing requirements, bacteriological results, and turbidity characteristics. High rates require more frequent washing, but the washing time (i. e., time out of service) for high rate filters is the same as for standard rate filters. The bacteriological removal averages about the same for both types of filters—in these studies the water was prechlorinated, but not to the extent that postchlorination was unnecessary. Colloidal turbidity averages less than one per cent in water filtered at high rates, the floc volume being about 15 times the turbidity.

The value of employing cotton plug filters in these studies has been confirmed. Two years of study show rates as high as 5 gal. per sq. ft. per min. are satisfactory (where hydraulics of the plant permit), and that such high rates are made possible by the use of coagulant aids to strengthen floc. In fact, a rate of 3.5 gal. per sq. ft. per min. will be generally applicable. Mr. Baylis suggested one or two filters be operated at this rate before changing over an entire plant. He recommended 0.65 to 0.70 mm. as an effective size of sand for use in high rate filters.

Aquatic Growths in Reservoirs

"CONTROLLING AQUATIC GROWTHS IN IMPOUNDING RESERVOIRS" by E. W. Surber, Upper Miss. and Great Lakes Drainage Basins Office, U. S. Public Health Service, Chicago, Ill.

A wide experience in the control of aquatic growths was evident in the discussion presented by Mr. Surber, who employed color slides throughout to illustrate "before and after" aspects of treatment. The varied results are not easy to summarize, as control chemicals included 2-4-D, sodium arsenite, copper sulfate, nigrosine dye, etc. Many experimental variations of methods of application were discussed. It was not made clear which of these methods, if any, would be applicable to the control of aquatic growths in water supply reservoirs. The published paper, however, should provide much useful information.

Chemical Contamination

"POSSIBLE HAZARDS RESULTING FROM CHEMICAL CONTAMINATION OF WATER SUPPLIES" by C. W. Muhlenberger, Toxicologist, Div. of Labs., State Dept. of Health, Lansing, Mich.

In a review of the subject which will constitute a valuable literature reference when published, Mr. Muhlenberger emphasized that most available data on chemical toxicity refers to a single dose of a poison. In water contamination, toxicity is dependent on the cumulative or non-cumulative characteristics of the toxic material. Chronic poisoning is difficult to detect and to diagnose. Differences in personal sensitivity, and the many other variables, have made it necessary to utilize experimental animals for data.

For example, he pointed out that chromium in trivalent form is of no toxic significance, but hexavalent chromium is a powerful oxidizing agent and decidedly poisonous. Most records in medical literature, however, are of acute cases and not chronic—in fact, there is no record applying to human poisoning where small amounts have been ingested over a long time. Chromic acid and bichromates are widely used as industrial chemicals and constitute potential hazards. Animal studies indicate the U. S. Public Health Service maximum allowable concentration of hexavalent chromium (0.05 ppm.) to be conservative. The need for experimental evidence and engineering data is very great in this field.

This paper was discussed by R. L. DERBY, Los Angeles, who agreed as to the inadequate and conflicting nature of the data on which standards have been based. Boron is a significant element in irrigation water—deleterious to plants, but tolerable to humans. So little is known about the trace elements in water that he recommends a U. S. Public Health Service grant be requested to investigate the subject.

GEORGE NORCOM, Consultant, New York, N. Y., pointed out that the discussion of chemical contaminants is almost always restricted to inorganic constituents. He stated the potential organic contaminants to constitute an enormous additional field — organic weed killers are an example, but discharges and spills of material from chemical manufacture must be considered.

Pollution Problems

J. H. Murdock, Jr.
Vice Pres.
Amer. Wat. Wks. Co.
New York City

A. R. Todd
Supt.
Filtration
Wheeling, W. Va.

B. C. NESIN, Dept. of Water Supply, Gas and Electricity, New York, N. Y., discussed organic chlorine reaction products as another phase of the subject meriting investigation. The number, complexity, and toxic effect of these constitutes a very large field of study.

Pollution Problem Explored

Technical papers of interest to both the Water Resources Division and the Water Purification Division were presented in a joint session. These papers explored the pollution problem from several aspects: the contributing factors, the required adjustment of water treatment, and legal aspects.

"ADJUSTMENT OF WATER TREATMENT TO POLLUTION LOADING" by H. A. Faber, Research Chemist, The Chlorine Institute, Inc., New York, N. Y.

Mr. Faber appraised the requirements for adjusting water treatment to pollution loading, defining the terms employed. For illustration, he pointed out that there is no typical treatment plant, but that the processes used by six different plants (where heavy pol-

lution loading must be treated) serve as good illustrations of practice.

By means of simplified flow diagrams, his paper explained the physical and chemical methods employed to satisfactorily treat polluted surface waters. Great variability was evident in coagulant requirements ranging from the high average use of alum (240 lb. per mil. gal.) at Spruance where over-all chemical costs are lowest; to the low average use of ferrous sulfate (35 lb. per mil. gal.) at Wheeling, where chlorine applied is highest. The chlorine requirement is 100 lb. per mil. gal. at Wheeling and 13.5 lb. per mil. gal. at Spruance.

The collected data presented here indicate the operating costs, when treating heavily polluted water to be increased by not more than 10 per cent —and the increased capital costs to be of the same order of magnitude. The problem appears to be one of adequate plant flexibility and of greater operator responsibility. The paper served as an introduction to discussions by those who supervised the plants used for illustration.

The discussors were: K. C. Armstrong, Supt. of Filtration, Chester, Pa.; Frank J. DeHooge, Supt. of Filtration, Passaic Valley Water Comm., Little Falls, N. J.; E. B. Evans, Water Purif. Supervisor, Cincinnati, Ohio; B. L. Strother, Water Purif. Supervisor, Spruance Works, E. I. duPont deNemours and Co., Richmond, Va.; A. R. Todd, Supt. of Filtration, Wheeling, West Va.; and D. B. Williams, In Charge of Purification, Brantford, Ont., Canada. Each discussor reviewed specific operating details which have made it possible to solve the particular problems relating to the raw water characteristics of his supply. It is anticipated that the publication of this paper and of the detailed discussions will provide a useful symposium on the methods for successful treatment of polluted surface waters.

"Evaluating the Factors Contributing to Water Pollution" by L. L. Hedgepeth, Technical Consultant, American Cyanamid Co., Bound Brook, N.J.

Discussors

Rolf Eliassen
Prof. San. Engr.
Mass. Inst. Tech.
Cambridge, Mass.

E. B. Evans
Supt.
Filtration
Cincinnati, O.

Mr. Hedgepeth ably differentiated the factors involved in water pollution, and outlined the functions of control agencies in this field. He reviewed the record of stream degradation in this country and pointed out the decision has now been reached to require that our natural waters be used without abuse. The problem in stream pollution control is to protect the presently clean waters and to restore the unclean waters.

Critical examination of our concepts of pollution and of suitable treatment processes is necessary to establish sound abatement policies. Limiting concentrations of undesirable substances in a stream by police authority cannot be successful unless the requirements are applicable to the facts of the case. Discussing the actual contributions to pollution control, Mr. Hedgepeth reported an encouraging picture. We have the know-how for the adequate treatment of sanitary sewage and the program, which will be quite costly, is well under way. Management of our leading industries has now determined that, as a matter of policy, stream pollution prevention will be an integral part of all new or expanded plants, and that the attack on existing pollution must be continued until a satisfactory solution is found.

"Pollution Control vs. Property Rights" by J. H. Murdoch, Jr., Vice Pres. and Counsel, American Water Works Service Co., Inc., Philadelphia, Pa.

Mr. Murdoch endeavored to describe the complex conflict of interests involved in this subject—pointing out that a lawyer is often needed but is seldom welcome to solve the problems which arise.

He illustrated the legal complexities by using, as a hypothetical example, the status of Somewhere Creek on which the Ancient Coal Company had property rights. Somewhere Creeks provides a source of water for farmers, a community water supply, and for industrial users. The New Strip Mine and several chemical and rayon manufacturers are later arrivals who also have property rights. A different relationship develops because of acid mine drainage which damages the water supply. Each water user would suffer if required to give up its practices contributing to the pollution of Somewhere Creek.

Mr. Murdoch pointed out that when public health is endangered the result is an offense against the state, and such a public nuisance may be abated by the state without compensation. However, even the state must weigh the effect of its prohibitions against the need for water. In general, he considers the public and industry are beginning to realize that our water resources are limited, that much pollution is avoidable, and that certain unpleasant facts must be acted upon.

Corrosion Short Course at Case

A Corrosion Short Course is scheduled for Case Institute of Technology, Cleveland, Sept. 25-29. Nine lecture periods of 2 to 2½ hours each will be given. The course will be under the direction of Dr. R. B. Hoxeng. The lecture course will be designed as a refresher course for those actively engaged in corrosion prevention, but will not be too advanced for those just entering the field. Two lectures will be held each day. Visiting professors and experts will aid in the presentation of the lectures. The meeting is being held with the cooperation of the Nat. Assn. of Corrosion Engineers.

For further information and official application blanks, write to Dr. R. B. Hoxeng, Case Inst. of Tech., Cleveland 6, Ohio.

The Cost of Pollution Abatement

Industry is talking and thinking a lot about pollution correction these days and the costs are soaring beyond earlier expectations. For instance a General Motors executive recently estimated that for waste control at General Motors plants the equipment investment will represent between 2 and 3% of the company's overall capital investment.

Fred. H. Weed Joins Buck, Seifert and Jost

Frederick H. Weed, for the past four years, engineer in charge of the planning and developing of the Miami, Fla. metropolitan water system, has become associated with the firm of Buck, Seifert and Jost, Consulting Engineers, New York City.

Mr. Weed was chief of the Water Supply Section of the War Production Board's Water Division during World War II and was Army Officer in charge of water, and sewage disposal at Camp Dix, N. J. during World War I. He has had more than 30 years of experience and has served with a number of famous engineering firms.

IMPROVING WATER QUALITY BY RESERVOIR CLEANING AND SWAMP DRAINING

by

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Sanitary Engr. & Chemist
NEW HAVEN WATER CO.
NEW HAVEN, CONN.

THE New Haven Water Company over a period of twenty-five years, in order to improve the quality of water in regard to color and taste and odor, has cleaned the bottom of two reservoirs and drained many swampy areas. The removal of muck from the bottom of these reservoirs and the largest of the projects of swamp draining will be discussed in this paper.

The first reservoir cleaned in the summer of 1941 was the Prospect Reservoir. This reservoir has an area of 8.6 acres with a maximum water depth of thirteen feet and an average depth of eight feet. The deposit of muck removed from the bottom of the reservoir averaged four feet in depth, although in some places it was more than five feet deep. A proportion of this muck was the top soil which had not been stripped before the reservoir was filled. The cost of removing this muck from the reservoir was eighty cents per cubic yard.

Prospect Reservoir, which is over fifty years old, is located in a sparsely inhabited country with very few houses and very little pasture land on the watershed. The shoreline is planted with pine trees for a distance of at least a hundred feet from the edge of the reservoir. The feeder brooks, which flow through hard and soft wood forests, are very fast and carry a great many leaves. An attempt is made to catch these leaves by building stilling basins of stones across the brooks. These basins do some good but still a large amount of material is carried into the reservoir.

In the early thirties a swampy, earthy taste started to develop in the water. This became progressively worse and was accompanied by growths of micro-organisms which were destroyed only with great difficulty by the use of copper sulphate. The condition became so bad that this source of the water supply had to be temporarily abandoned in 1935.

In 1941 this supply was again needed and, as the quality of the water had not improved, means were desperately needed to improve it. It was decided to drain the reservoir and remove the muck from the bottom.

Method of Muck Removal

The Company which had the contract to remove this muck at first attempted to do it by using a road scraping truck drawn by a tractor. This method proved unsatisfactory because the bottom of the reservoir was so uneven that it was nearly impossible to draw the truck. Further, the muck was so wet that half of the load would be lost before reaching the dump pile. After several trials it was found that a bull-dozer, to push the muck into piles, and a shovel to load these piles into trucks for carting to a waste pile, was the easiest method of removal. We were fortunate to have enough low places not more than a thousand feet from the reservoir into which the muck could be dumped and not find its way into the reservoir again. The removal of this material from the bottom of the reservoir left a clear, clean gravel bottom.

When the reservoir was filled it had to be treated once with copper sulphate and allowed to age about sixty days before the water had physical characteristics which would allow it to be used. Since this source of supply was again put into service the water has been in very satisfactory condition.

The second reservoir to be cleaned was the Beaver Brook Reservoir. This reservoir was giving the same kind of trouble as was found in the Prospect Reservoir, high color, bad taste and odor, and microscopic organisms which made the water appear green. All of these could be controlled by copper treatment followed by activated carbon applied direct to the reservoir [1], or by treatment with chlorine gas applied direct to the reservoir, followed by activated carbon applied to the reservoir. The treatment had to be applied every ten days throughout the summer. As we obtained satisfactory results by removing the muck from Lake Prospect it was decided to apply this same treatment to the Beaver Brook Reservoir.

The watershed area of Beaver Brook is 1.3 square miles and sparsely inhabited. The run off is rapid in spite of considerable swampy area. The reservoir is surrounded by pines, but most of the watershed area is covered with deciduous trees.

The reservoir which is formed by damming Beaver Brook has an area of 13 acres and stores 18 million gallons of water. The maximum depth of the water is eighteen feet with an average depth of eight feet. The ground was not stripped before flooding. The average depth of the muck was three feet but we found places where the peat was more than twelve feet deep.

Bull-dozers, shovels and trucks were used as earlier described to remove the muck to a gravel bottom at the cost of seventy-five cents per cubic yard. Again we were fortunate enough to have a place to dump the removed material near at hand, this helped to reduce the cost.

The peaty area was about three hundred feet square and of such an elevation that it was covered by about three feet of water. In order to find a gravel bottom under this area it was necessary to excavate to a depth of about twelve feet. The removal of the peat area which was done in the winter was made easier as the ground was frozen enough to allow a shovel with a clam shell bucket and trucks to operate on its surface. The entire area of peat was not removed to a depth of twelve feet as the cost would have been too great. We removed about one half of it to a depth of twelve feet and figured that when the reservoir was filled the remainder of the area would slump. This actually happened and the average depth at this point is now about ten feet. When the reservoir was filled it took about three months and a treatment with copper sulphate to produce satisfactory water. Since the summer of

(1) Reported by the author in "Water Works & Sewerage"—May 1935.

1944, when the water was again used, its physical characteristics have been entirely satisfactory.

Swamp Draining

In addition to cleaning the two reservoirs, we have three swampy areas where a considerable amount of ditching has been done to remove stagnant water from swamps so that highly colored water would not enter the reservoir.

The ditch on the Lake Wintergreen supply is 8500 feet long and drains an area of about three acres. This ditch is about four feet wide at the bottom and ten at the top. Four thousand feet has a grade of one to six hundred, the remainder of the ditch has a grade of one to twelve hundred. The material excavated was very wet and kept sliding back into the ditch. This was stopped by constructing a woven wood fence. This fence was made by driving wooden stakes three feet apart and then weaving saplings between them. This held the mud back in a satisfactory manner.

The bottom of the ditch at the end of the construction was of a hard white substance but, on getting wet, softened up and was carried into the reservoir as a white colloidal material. This made it necessary to pave the bottom of the ditch with stone. The grade of one to twelve hundred is too flat in that the movement of the water is too slow to keep the ditch clean. Cat-tails grow abundantly and it requires the attention of two men the entire summer to maintain the ditch in a condition where the water will run freely through it. The ditch now brings water with good physical qualities into the lake instead of a highly colored swamp water as it formerly entered the lake. As fifty percent of the water from the watered area had to traverse this swampy area it was well worth the effort to construct the ditch.

The quantities of earth removed and the cost figured are not available as the project was done by our own men at a time when other work was slack.

The next swampy area drained was at Beaver Brook Reservoir. At this location practically all the water flowing into the reservoir had to pass through a swampy area of one acre in extent. The main ditch starts at some springs, which are the main source of supply, and is six feet on the bottom which is three feet below normal ground surface. This ditch is about four thousand feet long with a grade of about one to a thousand. The bottom of this ditch is a very good grade of gravel and the flow of water is rapid enough to eliminate most of the growths on the bottom. Twice during the summer the ditch is cleaned and it takes about ten days and two men to do this work.

At the lower end of the ditch was an area of stagnant water of about four hundred square feet area. This was caused by the backing up of the water in the reservoir. This condition has recently been corrected by laying four hundred feet of forty-two inch cast-iron pipe with tight joints on a grade of one to four hundred; and, then filling the entire area with gravel.

This ditching and piping has allowed the water entering the reservoir to be very clear and of low color where in the past it had a high color and very bad taste and odor.

The third swamp to be drained was the Brenski swamp area of the Lake Gaillard watershed. This work drains the swampy area of two hundred and eighty acres. This area can be divided into two sections, the north section and the south section. The north section has 7,788 feet of reinforced concrete pipe, including the side laterals, twenty-four inch to forty-eight inch diameter with twenty-one manholes. There is 6,350 feet of ditch with a maximum depth of nine feet with a total excavation of 30,000 cubic yards.

In laying this concrete pipe the ditch was excavated, the pipe laid about an inch apart, the section round the opening of the pipe back filled with crushed stone of about one inch in diameter and then the entire ditch back filled with the excavated material and the whole section levelled off with a bull-dozer.

The south section has 3,020 feet of concrete pipe varying in size from twenty-four inches to eight inches in diameter with seven manholes. This pipe was laid in the same manner as the north section.

After this drain was laid the color of the water entering the reservoir from the swamp was reduced from 300 p.p.m. to less than 20 p.p.m. at most times. Occasionally the maximum is 60 p.p.m. Also the ground has dried up to such an extent that it has been possible to clean out the underbrush and have a good stand of timber.

We feel that the expense of cleaning the reservoirs and draining the swamps was well worth the cost, since it has enabled us to serve our customers with a better quality water. It has also made use of free-residual chlorination practicable.

Ed. Note: This paper, presented before the New England Water Works Assn. by the author, is here printed by permission.

EXHIBITORS FOR FSWA MEETING AT WASHINGTON, D.C.

As of July 17, the following members of the Water and Sewage Works Manufacturers Assn., Inc., had reserved exhibit space for the forthcoming *FEDERATION OF SEWAGE WORKS ASSOCIATION'S CONVENTION* to be held at the Hotel Statler, Washington, D. C., October 9-12, 1950:

American City Magazine, The
American Well Works, The
Builders-Providence, Inc.
Carter Co., Ralph B.
Chain Belt Co.
Chicago Pump Co.
Dorr Co., Inc., The
Engineering News-Record
General Electric Co.
Hardinge Co., Inc.
Infilco Inc.
Jeffrey Manufacturing Co., The
Johns-Manville
Lakeside Engineering Corp.
Limestone Products Corp. of America
Link-Belt Co.
Lock Joint Pipe Co.
Nichols Engineering and Research Corp.
Pacific-Flush Tank Co.
Public Works Magazine
Sewage & Industrial Wastes Engineering
Simplex Valve & Meter Co.
Stewart, Inc., W. H.
Walker Process Equipment, Inc.
Wallace & Tiernan Co., Inc.
Water & Sewage Works
Westinghouse Electric Corp.
Worthington Pump and Machinery Corp.
Yeomans Brothers Co.

"Don't File a Thing!—I want to be able to find something when I need it. I know right where everything is, Miss Prim."

SOME UNUSUAL WATER WORKS SERVE CITIES IN THE CARIBBEAN

by

RAY B. PLUMMER*

Chief Engineer

R. L. KENAN & ASSOCIATES

MONTGOMERY, ALA.

PERHAPS two of the most unusual waterworks installations in the Western Hemisphere are being constructed for the City of Charlotte Amalie on the Island of St. Thomas and for the Village of Cruz Bay on the Island of St. Johns.

At Charlotte Amalie the water supply and treatment facilities will include a 4200-ft. long, paved airport runway, a rapid sand filtering plant mounted on a motor truck, a 2000-ft. long gallery well, seventeen large-concrete paved, rain water catchment areas, three impounding dams, provision for recharge of ground water, a slow sand filter and a conventional rapid sand filtering plant.

At Cruz Bay the public water supply will be produced from sea water by solar distillation. All of the heat required by the process will be supplied by the sun and all of the power required for pumping will be derived from the wind.

St. Thomas and St. Johns are two of the three American Virgin Islands which are part of the Lesser Antilles group in the West Indies. St. Thomas lies about 40 miles east of Puerto Rico and about 1200 miles southeast of Miami. St. Johns is a few miles farther east. United States purchased the islands from Denmark in 1917 for use as a naval base from which to defend the Panama Canal.

Both islands are mountainous with a maximum elevation of 1500 feet on St. Thomas and 1000 feet on St. Johns. Soils are thin due to the rapid runoff on the steep grades during the intense tropical storms. At the present level of the islands, all limestone and coral rocks are in ledges beneath the sea. Trade winds blow steadily from the east during practically the entire year. The highest and lowest temperatures of record are 91° and 68°, respectively. Yearly evaporation rates vary from 40 inches to 80 inches, depending on exposure. Annual rainfall averages are from 55 inches to less than 20 inches, depending on location relative to the mountain peaks.

*At present pursuing advanced courses in sanitary engineering at the Univ. of Illinois.

The Author

Catchment Areas

Prior to recent construction, the 10,000 inhabitants of Charlotte Amalie obtained their public water supply from thirteen catchments on the mountain sides, in and around the city. They were constructed by paving from 0.2 to 2.5-acres of the mountainside with concrete and providing one or more concrete reservoirs at the down slope side. In some instances slopes on the catchments were over 40-degrees. Most of the rainfall occurs during the last four months of the year. During the annual dry season, which lasts for about 100 days, rains rarely fall and precipitation preceding and following the dry season does not supply concurrent needs. Therefore, large quantities of water must be stored each year to supply minimum requirements. If all of the reservoirs were full at the beginning of the dry season, about 2 gal. per cap. per day were available throughout the critical period. However, storage normally provided less than this amount and in some years less than 0.8 gal. per cap. per day has been available. Those, financially able, could purchase water imported from Puerto Rico. The price is said to have been $2.50 to $4.50 per long ton of 264 gallons.

When water was available from public supplies, it had to be carried from one of the reservoirs. Frequently, this required climbing steep stairs for several blocks and traveling considerable distances. When local reservoirs became exhausted and only those remote from the city had a supply, the task of carrying water became a hardship. During critical shortages all water was rationed. At such times, valves were unlocked for only an hour or two each day.

Expanded Supply Needed

The need for an expanded supply and better distribution facilities had been recognized for a long time. The income of the local government has always been too small to permit financing of major works. The Federal Government did not act until 1946, when Congress authorized the Federal Works Agency to plan necessary improvements.

The private engineering companies, employed by Federal Works Agency, attempted to consider every known method of providing potable water. Heat distillation and ion exchange de-mineralization of sea water were rejected because of operating costs. Deep, rock wells were found to be impractical when tests on an 1100-feet deep well showed a production of less than 0.7 gallons per minute at a drawdown below sea level. A possible site for a limited impounded supply was found at only one place on St. Thomas. This was a long distance from the city and over a range of mountains. An adequate number of mountainside catchments with their appurtinant reservoirs were estimated to cost more than the funds available.

Alluvium, in sufficient volume to warrant consideration of shallow wells, was present in only two places near the city. The largest, at the airport, was selected for investigation. An airstrip had been constructed on a flat area, about 1,000-feet wide by 4,000-feet long, which lay between the beach and the talus at the bases of the three highest mountains on the island. The entire flat area was occupied by the airport and the Army Air Base.

A mangrove swamp had originally occupied the western third of the area. When this was filled in by dredging from the bay, during the construction of the runway, the entire area had been very thoroughly saturated with sea water. Investigations, however, showed that much of the area was again unusable for a well field. Near the center, where the Army had installed a well, to supply brackish water for street sprinkling, the ground water was almost free of chlorides. The eastern third was found to have recovered completely.

Ground Water Storage

Meter records of the production of the Air Base well indicated that considerable quantities of water could be stored in the ground if it could be introduced into the aquifer. The rock of the island weathers to a fine, light texture, grey clay. This material provides an effective barrier against infiltration; it is further limited by the rapid runoff from the short, intense, tropical storms. The heavy deposit of talus at the bases of the mountains, suggested that materials of larger grain size, which had resisted washing, might be found there. The flat top of the talus was crossed by three runoff channels, which obviously carried the precipitation excess from the southern faces of the three mountains. In order to test the feasibility of recharge works at this point, a series of wells were dug to a depth of about 30-feet along the top of the talus. These were filled with water from the Air Base catchment reservoir and the storage coefficients and transmissibility computed from the rates of infiltration. These computations gave results indicating that from four to twelve million gallons might be stored each year, in the area between the top of the talus and the airport. The expected storage within the limits stated would depend upon the storm pattern and alluvium in the intervening distance. Provisions were made in the plans for three impounding dams to detain the runoff. To facilitate absorption into the ground, a trench to be filled with permeable material, graded after the Vicksburg recommendations, was provided along the upstream edge of the dams. The upper 12-inches of trench fill consisted of beach sand, to prevent entry of fines into the trench.

The plans also included a gallery well on the landing field area to recover the water recharged at the top of the talus. This well consisted of a trench, 12 feet deep, by 4 feet wide, by 2,000 feet long, fitted with a perforated pipe running the length of the well. The trench was backfilled with the same material used in the recharge gallery except that the beach sand top layer of the recharge gallery was replaced by a layer of impervious clay. A similar well was provided through the high chloride area to facilitate removal of the remaining sea water. This gallery was identical in construction to the gallery well except that it emptied into the sea. The gallery well and the gallery drain are on the same axis in the expectation that portions of the drain may be converted to well line as the aquifers are cleared of chlorides by the ground water flow. The gallery well will discharge by gravity through a swing pipe in the receiving sump. Thus the head on the well can be closely maintained to guard against salt water intrusion. The operator may be forewarned of incipient salt water movement toward the well field by means of routine chloride determinations on samples taken from four observation wells along the beach. To facilitate this work, a Beckman pH meter with special electrodes for chloride determinations is supplied as part of the laboratory equipment.

Catchment Area on Mountainside—Charlotte Amalie Below

Recharge Experiments

The recharge experiments had indicated that the well field could not supply the necessary additional quantity of water. Of all the methods examined, catchments seemed to be the only method that could supply the deficit, at an operating cost within the budget limitations of the Island Government. Hand construction of a million square feet of catchment on the side of the mountain was out of the question. The only flat area, close to the well field, was on the airport, which was unpaved except for several hundred feet of thin asphaltic concrete. Therefore the decision was made, to construct a full length paved landing strip which would supply the additional water as storm runoff. A 4,200-feet-long by 200-feet-wide runway was computed to be necessary. The plans provided for one side to be elevated to direct the runoff to a single line of entrance structures in one shoulder. The need for large pipe was eliminated by providing storage hoppers continuously along the low shoulder. The storage depressions were constructed as inverted pyramids with the bases each 200 feet by 35 feet. Each hopper centered on an inlet where the depth of the hopper was about 11 inches. Uniform drawoff from each hopper is provided and flooding of lower inlets prevented by adjustable shutter plates on the inlets. Runoff in excess of design will be conducted to the sea through an overflow provision.

The receiving sump from the gallery well and the runoff from the airstrip discharge into a 1½ mil. gal. underground reservoir. Excess water is wasted to the sea. Pumps are supplied for recirculating the water, for adding chemicals and for transferring the water to other reservoirs and to the plant for treatment.

The engineers had concentrated their efforts, to develop a water supply, in the vicinity of the airport which was adjacent to the Army Air Base and Navy's Submarine Base. It was known that abandonment of these bases was being considered. The permanent facilities of the bases were now formally turned over to the Island Government. This added over 4 mil. gal. of storage facilities and five catchments to the other installations and brought the estimated insured supply to a minimum of about 16 gal per cap. per day.

Filter Plant

Plans provide for the construction of a conventional rapid and filtering plant and pumping station adjacent to the underground reservoir. The waterworks at each of the bases will also discharge into the reservoir. Finished water will be stored in a 1 mil. gal. clearwell. Two 100,000-gallon elevated tanks will float on the distribution system.

At the treatment plant, four chemical feeders with manifold discharge lines provide ability to pretreat at three points and to post treat at two points. Finished water may be recharged into the gallery well for storage or to provide a greater positive head against the sea. All pumps are multipurpose and the yard piping provides maximum flexibility. Facilities are also provided for recovery of washwater from the four stationary filters as well as from the portable filters which will be backwashed at the plant.

buildings, hotels, schools and homes desiring service.

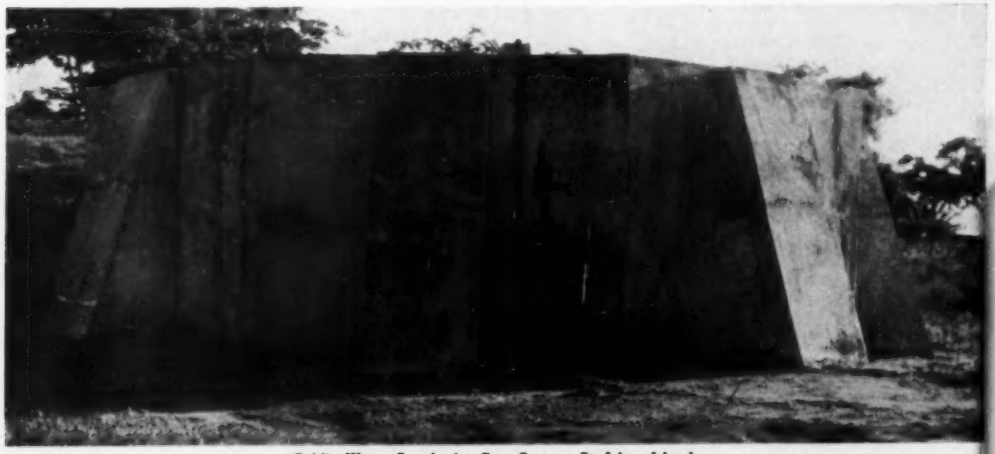
Simple chemical laboratory equipment is provided at the plant laboratory. Bacteriological work will be done by the laboratory of the Government Hospital.

Solar Distillation System

At the neighboring settlement of Cruz Bay, on the Island of St. Johns, the 170 residents have obtained their entire water supply from roof runoff. The opportunity to construct wells in the vicinity does not exist. Therefore

bottom, the temperature and the evaporation rate of the water are increased. Condensation collects on the underside of the glass which remains at near atmospheric temperature. Inside gutters are provided to collect the condensate. Preliminary tests indicated that four square feet of pan will produce about one gallon per day, in that latitude. The plans provide for a 1,000 gpd. unit to be built. Water, for the pans, will be pumped from the sea by windmill driven pumps.

Engineering investigations, plans and supervision of construction are



Public Water Supply for Cruz Bay on St. Johns Island

Water from the thirteen catchments in the city will be treated and pumped into the system by means of a portable filter plant mounted on a motor truck. The plant includes two pressure filters, an engine driven, high service pump and two chemical feeders. Flanged terminal, reinforced, high pressure hose will be used to connect the plant to the system and the catchment reservoir outlet at each of the thirteen catchments.

A complete distribution system, of cement lined, mechanical joint cast iron pipe, provides potable water at 80 street corner faucets and service connections to all businesses, government

catchments had been planned to supply the public water. Before construction commenced, the Armed Services requested that a full scale test of a solar distillation unit be provided in the waterworks for the islands. Cruz Bay was selected for this test.

Essentially, the distillation unit consists of a shallow concrete pan, with an insulated black bottom, covered by an airtight, clear glass skylight. The inside bottom of the pan is insulated with about three inches of waterproofed vermiculite concrete and one-inch sheets of celotex, bedded in and coated with asphalt. As the sunlight, through the glass, strikes the black

by R. L. Kenan and Assocs., Consulting Engineers, Montgomery, Ala. In this work, able assistance was given by C. L. McGuiness, Senior Geologist, U. S. G. S., Carl Izzard, Senior Highway Engineer, P. R. A., and others. All work was executed under the administration of Rufe Newman, Deputy Commissioner, F. W. A. and Chief, Bureau of Community Facilities. Plans and engineering were reviewed by Garland Rounds, Chief Engineers, Bureau of Community Facilities, F. W. A. Interests of the Virgin Island Government were represented by William H. Hastie, Governor, and Donald Boreham, Supt. Public Works, St. Thomas.

AWWA Specs. on NaCl Available

The American Water Works Assn. has announced the availability of "Tentative Standard Specifications for Sodium Chloride." Carrying the key number 5W1.01-T this specification, which was approved as tentative by the Board of Directors in July, 1949. Copies may be obtained for 20 cents each from the Amer. Water Works Assn., 500 Fifth Ave., New York 18, N.Y.

Chemical Engineering Costs

A New Book

Industrial Research Service, Dover, N.H., has announced the availability of a new book titled "CHEMICAL ENGINEERING COSTS" by O. T. Zimmerman and Irvin Lavine. Six of the 20 chapters will be of interest to engineers and operators in the field of water supply, sewage and industrial waste treatment. These chapters are devoted to vacuum filters, fans, centrifugal pumps, rotameters, water conditioning, and industrial materials.

The book contains 400 pages, 354 illustrations, 200 cost charts, and 100 tables. It may be obtained for $6.50 per copy from Industrial Research Service, Dover, New Hampshire.

SERVICE AWARDS

Can be an Important Factor in Better Water and Sewage Employee Relations

by

KELCY KERN
NEW YORK CITY

EMPLOYERS in the water works field have long recognized that keeping the individual employee contented, maintaining his attitude of loyalty toward employer and his job, is not the least of many factors making for better employee relations. And, regardless of the water works "labor problem" in its broader aspects, this question of maintaining a satisfactory close-range relationship between employer and employee is largely one for the individual employer to solve.

Several methods have been devised and used with success in recognizing efficiency, and honoring loyalty and length of service. It has been found that the practice of awarding service emblems is rapidly on the increase, and now usually supplements all other forms of recognition.

Numerous water and sewage works throughout the country have successfully followed general industry and private business in using the award system to boost morale and increase personal efficiency.

In the long run, of course, all such projects result in increased production, fewer management "headaches," and better profits through greater efficiency, increase in production rate, and better quality of work.

Methods of Recognition

In considering this highly important factor in good employee relations, the employer will want to weigh all methods. Recent surveys over a cross section of employing concerns (with 100 or more employees) have brought to light some interesting and useful ideas. For instance; the cash reward has been used by some employers, and, we know, cash is always welcome to the employee.

Yet, it has been found that cash awards are apt to be over-costly to the employer. Then, too, it is not always easy to establish cash awards on a fair basis. And, the *effectual* "life" of the cash gift is usually short once the recipient has spent the money. As a rule experienced employers prefer to tie-in cash awards with some form of lasting emblem as a means of prolonging the "memory" of the occasion when both were presented.

There is, also, the system of gifts, and the gift is a valuable award providing, of course, it is suitable, also that it be tied-in with the emblem. Otherwise, the gift, may serve only a *limited* time as a "live" reminder of the long service that earned it.

However, the giving of emblems for recognition, achievement or incentive is most effective, say those who have used them over the years, is to make the practice an *established* project or program and to set up procedures which will insure the best long run results both to employer and employee. The beneficial effects of such awards lie, to a great extent, in their being made as "public" as is possible, "public" in the organization among the receivers' own co-workers, and also in the community—which tends to establish the organizations there as "a good one for which to work."

Accordingly the objectives of the employer must be:

a) To gratify the pride of the employee who has earned recognition for continued service.
b) To keep alive remembrance of the presentation among all fellow employes as well as of the recipient.
c) To establish an *incentive* for other employees to gain similar honor.
d) To bind the employee to employer and job—more loyally by this very human and voluntary act of signal recognition.

Example

The awards program that has prevailed for years at Swift & Co. and which has attracted widespread atten-

Elements of Effectual Merit Award Projects

tion in all lines for its success is described as follows by Harold F. North, Swift Industrial Relations Dept.:

"Since 1938 when the Report to Employes edition of our Swift News was begun, we recognized length of service for Swift employes by printing the names in the report of those with twenty and more years of service. This proved popular among employes but offered only annual recognition of this kind. Of course, vacations with pay, increased illness benefits, non-contributory pensions, and other similar programs provide what amounts to financial recognition for long unbroken service.

"In the light of our experience with the publishing of names and recognizing that man lives 'not by bread alone,' we began to look for other ways to give service recognition. We sensed that man likes to feel that he is part of a team and naturally seeks some way to identify that association whenever the opportunity presents itself. Naturally the service pin offered the best recognition of this interest.

"It is our intention that each year the November edition of the Swift News will become the service recognition edition."

Features of Program

Great advances have been made in the design and production of emblems of this type and millions of them are now produced and distributed each year in American industry, education, transport, commerce, business, and hundreds of other fields of human activity where service and loyalty are to be recognized.

Let us consider some of the features of such a program, based upon experience.

In adopting such a program, even to a limited extent, or even on a trial basis, the employer is taking advantage of some well-established traits in human character. Because most workers of all types naturally take pride in their work and an interest in achievement, largely to the extent to which it is not only recognized but *rewarded*. Many employers are of the belief that emblematic awards, properly presented and with the best possible "promotion," may be counted among the most valuable techniques in building a sound industrial or employee relations program. (Suggested reading on this topic: "It's Still A Good Idea" American Publishers, Box 116, Utica, New York.)

Primary reasons appropriate for emplematic awards, may be summed up:

1. Recognition of seniority
2. Length of service acknowledgment
3. Quarter-century clubs
4. Seniority, in a section, zone or department
5. Production, or accomplishment recognition
6. Safety record
7. Constructive ideas provide and/or suggestions made.

Certain users have found that, in some instances, such programs fail to succeed to the extent expected, and that is nearly always because of lack of a good program to properly "sell" the idea and to make the most of its application. To call an employee into the manager's office, for instance, to make a recognition award, man-to-man or woman-to-woman, accomplishes very little, because, it is just as much the "other fellow" you wish to impress, the co-worker who is influenced to "go and do likewise"—after getting visible evidence that the boss really does appreciate good work and proper conduct, and is willing to openly acknowledge and reward it.

Presentation Important

Time and place of presentation is of much importance.

One form of presentation is to make the occasion a luncheon or supper either with the whole organization present or those directly involved, such as departmental fellow workers. Experienced people in this work suggest that the highest possible official *personally* make the presentation and the citation clearly state exactly WHY it is made. At the same time, any future awards opportunities are also announced and department heads are encouraged to take the winners to lunch or otherwise entertain them as a means of accentuating the event.

In some instances, employers have found it a good idea to project Kodachrome slides on the screen at the time of presentation in order to accentuate the beauty of the emblem award. This is done, for instance, by The Tampa Electric Co. At the banquet celebrating the original establishment of their award program they projected slides on the screen and pointed out to their employees the finer details of the design and illustrated the various qualities of the emblems—the higher the year group the nicer the quality.

As the 5 year group were called up to receive their awards the 5 year emblem was thrown on the screen and similarly for the 10, 15, 20 and 25 year groups. Subsequent annual presentation observances are built up with propitious ceremony to enhance greatly the importance attached to the award and at the same time make the occasion so enjoyable as to be one to which all employees would look forward to with anticipation.

For instance, the personnel award play for years maintained by The Armstrong Cork Co., and which is based upon scientific studies of all phases of the recognition award, has attracted widespread national attention in business, service and industry. Concerning this employer's views on the method of presentation, Vernon W. Pitcher, Senior Personnel Assistant, Armstrong Cork Co., said to this writer:

"The Armstrong Cork Co. is convinced of the fact that the success of

Emblem Making
(A Fine Art Today)

A Presentation
(Proud Moment for the Recipient)

any business venture depends directly on the effectiveness of its organization. A personnel program must contribute to the effectiveness through policies and techniques which obtain and develop capable employees. An important part of our program is the provision of individual and group *recognition* to employees for their contributions to the organization and its objectives.

"We believe that employees as individuals or in groups have a desire for recognition as well as a right to receive such recognition.

"Of particular importance is the manner in which these various awards are presented for the mode of presentation and add significance to the award. Our service awards are presented by a member of top management in special ceremonies at annual banquets. Safety plaques are also presented at special plant ceremonies. Suggestion awards are always presented by the employee's supervisor and pictures of the presentation may appear in plant or company publications.

"Tangible evidences of recognition are valued highly by recipients. Of course, it is impossible to measure accurately the direct value to the company of these awards but the evaluation placed on them by recipients indicates their worthwhile place in our personnel program.

"In addition, there are other types of recognition received by employees —individual evaluation of each employee's performance, a record of the evaluation being filed in individual folders for use in selecting employees for promotion and thereby facilitating the elimination of departmental barriers in promotion; thorough training in preparation for the initial position or for possible promotion; assistance in case of death, disability or old age through carefully designed employee benefit plans; assistance in times of slack work which may occur in spite of careful forecasting of sales and scheduling of production; and others.

"In a social and political environment which stresses the importance of the individual, singularly or in groups, we believe there is a direct relationship between recognition and performance. Recognition given by any enterprise to those employees not only contributed to the overall effectiveness of the organization but also is consistent with the American philosophy of dignity of the individual."

Examples of American Emblems

With respect to the active promotion of such awards, this may be said:

It has been found that, in many instances, little provision is made to publicize the event either in the organization itself or in the community, when, as a matter of fact, when an important local employer rewards those working for him, the fact is *news* in the community in which his organization functions. Every fellow employe, in direct contact or not, is interested and all employes have friends and relatives directly interested.

Very often such events are noticed on regional radio broadcasts and in the local newspapers. Even pictures of honored employes of an established business or service are used in the newspapers, and such events certainly are "copy" for the organization's house organ and bulletinboard.

There are, of course, numerous variations in such programs.

For instance, some employers who have used the award system effectually over the years give attention to *group* awards. A banner or plaque may be awarded to such a group according to their *group* achievement—possibly along with individual emblems in the form of buttons and/or pins. The banner may be permanent or may be won by a competing department or group. All this, it is said, tends to establish a friendly rivalry among sections, zones, departments or groups.

Type of Emblem

With respect to the type of *emblem* best suited to various purposes, great improvements have been made in design and manufacture. There are pins and buttons of the less expensive type for the smaller organization, for more routine achievements, and more elaborate insignias, even some encrusted with gems, for such distinguished workers as the "sixty year employe."

It is one thing, of course, for the employer to maintain an annual program of merit awards and another to use a good system of promoting it when it comes to a contest for *performance* on the job, for seasonal times, when the safety program needs stimulation, attendance figures show lag, or the rate of performance needs a boost.

On the whole, however, recognition and incentive awards especially in the form and including the emblem, have become an established procedure with many tens of thousands of employers in all lines of business, with anywhere from 150 to hundreds of thousands of employees each. Properly programmed and exploited, they will help win the worker to a greater loyalty to the employer and better yet, a greater loyalty to his or her job.

WORTH WHILE PIPE JOINT POINTERS*

White lead is carbonate of lead ground in boiled linseed oil. It is commonly used for preventing leakage through threaded pipe joints and is all right where pressures are not severely high and where pressures are not turned on too soon.

Red lead is an oxide of lead ground in boiled linseed oil. Red lead hardens more quickly than white lead and is preferable where pressure is turned on soon after joints are made up. White lead is somewhat more durable than red lead, but as already stated it must be given more time. When properly used and given ample time white lead is preferable to red lead.

Some pipe men prefer graphite because of its lower coefficient of friction which enables the workman to do a better mechanical job. That is, the threads can be made to seat better. For example, in one instance red lead was used on brass piping. A test was made by subjecting the piping to pressure and it was found that over 80 per cent of the joints leaked. The line was taken down, the threads were washed with gasoline, and then a graphite mixture was used. All leaking was eliminated.

Litharge is lead monoxid and is made by heating lead in a current of air. Litharge is excellent where quick hardening is desired and where a truly durable and tight joint is wanted. It has been used with good results on ammonia lines. It hardens more quickly than does red lead, but of course it does not possess the low coefficient of friction of graphite.

*Contributed by W. F. Schaphorst, M.E., Newark, N.J.

"HOW NOT TO WRITE SPECIFICATIONS"

by

HELEN H. DUNHAM*
Just an Engineer's Secretary
JACKSONVILLE, FLA.

THE adage *"You do not have to be crazy to be an Engineer but it certainly helps"* is nowhere better illustrated than in the Engineer's practice of the obviously unlearned art of writing specifications.

As a defenseless member of the weaker sex, it is my misfortune to have to transcribe the uncouth noises and the gibberish uttered by Engineers, and endeavor to translate these weird sounds into English.

I urge all Secretaries to Engineers to form a new society or association in self-defense. The name of the society suggested by one of the disciples of Lydia Pinkham is "The Society for the Promulgation of Information and the Dissemination of Data Looking Towards the Inclusion of a Course of Specification Writing in the Curricula of all Engineering Colleges". The foregoing title as you-all will readily recognize is pure Engineeringese. It is just the fourteen syllable multi-worded engineering way of saying what in plain English is "Engineering Secretaries' Association".

Some Particularly Bad Practices

This society's motto might well be "Write plain English, you dopes". And its aims and ambitions are to lighten the load of the "poor working girl" to the extent permitted by the eradication of the following particularly bad practices:

1. Conferring (telling clean and not-so-clean stories) with manufacturers' representatives from 8:00 A.M. until 4:30 P.M. and then starting to dictate complete specifications to be sent to the client in the five o'clock mail.
2. Dictating while swallowing two-thirds of a lighted two-for-a-nickel cigar or a home-made (hand-rolled) cigarette, chewing on a candy bar, or drinking a Coca Cola.
3. Dictating while furiously pacing, with occasional sprints down the hallway, so that continuity of speech is lost, or a roving microphone is called for.
4. Laboriously writing out, in longhand, a particularly involved specification, in hand writing that any self-respecting chicken would disown.
5. Preparing a holographic (longhand) draft in the Engineer's usual unreadable handwriting, and further confusing the issue by spelling the words phonetically rather than according to accepted practice as set forth in Mr. Webster's Unabridged Dictionary.
6. Walking off while in the midst of dictating, to return an hour or so later with the comment "I completely forgot about you"—in other words, adding insult to injury.

Here is a paper written on the humorous side by Helen H. Dunham—"Just An Engineer's Secretary"—for presentation before the Florida Engineering Society at its Annual Meeting held recently in Tallahassee, Fla. It produced so many a chuckle during its reading by Miss Dunham, that we are presenting it for the enjoyment of our readers.

Here and there between the lines one will find a lesson or two, and perhaps sense the weight of a velvet gloved hand veiled in femininity and humor. Be that as it may, and even though the shoe may be found to pinch here and there, it's fun to read.

And—That Telephone!

Another important item of interruption is the TELEPHONE, that so necessary adjunct to the engineering profession. At any time—but preferably in the midst of a most highly technical specification, understandable only to another Engineer—comes the ring of that telephone. That ring is the signal for a minimum of at least a half hour of talk, argument or harangue, which settles nothing and is merely one Engineer showing off his knowledge to another Engineer—or to a hapless manufacturer's representative who, in the struggle to make an honest living, has become enmeshed in the Engineer's toils. Nothing is settled and this conversation is but a link in a chain of many such verbose effusions. Then comes the picking up of the thread of thought, granted of course that there is such a thread, which necessitates backtracking for a page or two of notes, granted also that the secretary has not long since fainted from ennui,—and there exists the apprehension that the phone is not silenced but temporarily resting, to enable each side to recruit fresh arguments, to break forth again at some other equally inconvenient time.

These are but a few of the many trials and tribulations which beset the young lady who is unfortunate enough to take a position in an engineering office in the fond hope that she will soon be a party to the secret of Einstein's Theory or Atomic Energy.

It is with great pride and extreme pleasure that I take this opportunity of paying homage and tribute to the august Dean of the College of Engineering at the University of Florida, Dean Joseph W. Weil, inasmuch as a perusal of Dean Weil's article on "Engineering Education" appearing in the current issue of the Florida Professional Engineer, states that the College of Engineering at the University of Florida provides a course numbered C-3 titled "Reading, Speaking and Writing". If I may be so bold, I suggest that the subject of spelling be included in this course, and that at least twice as many hours be allocated to the teaching of this course as has evidently been allocated heretofore, inasmuch as the prior products of this course (and of other similar courses at the more enlightened institutions which include any similar courses on these higher arts in their curricula) are definitely "on the sorry side" insofar as their ability to write or spell the English language is concerned.

No paper on "writing specifications" or "writing" anything would be complete without specific reference to the high disregard Engineers evince for the Spencerian art.

It is amazing to see or try to read the scribbling of an engineering draftsman who, in his engineering work can produce the most complicated drawing and, with the aid of the dictionary and certain other mechanical aids such as a Wrico or LeRoy lettering set, can print the titles, description and data most clearly and distinctly on the drawing.

This same fine engineering draftsman or designer when confronted with a sheet of plain white paper and holding either a pen or pencil in his hands, will produce hieroglyphics far beyond the power of any archaeologist or cryptographer to decipher.

*Executive Sec'y, Reynolds, Smith & Hills, Architects & Engineers, Jacksonville, Fla.

On "Issuing an Addendum"

A device that Engineers employ with fiendish glee to cover up (they fondly hope) their sins of omission is called "Issuing an Addendum" which normally involves the issuance of Addenda as their multiple sins come to light during the Contractor's efforts to set a bid price within the bounds of reason, and then build the structure so fondly envisioned by the Engineer.

Addenda are as prone to follow specifications as night is prone to follow day.

Next on the agenda of the less endearing traits of some Engineers is the "pack rat" procedure best exemplified by the following common occurrence.

The Engineer decides to include a choice item of information (technical or otherwise) that has been saved for a future apropos occasion. A diligent search of the files, both active and those which have been placed in the "morgue" (that supposed-to-be-final resting place of data after a job has been finished)—fails to disclose any such information. After much excitement, which generally includes snagging a new pair of nylons and breaking a shoulder strap when reaching up to a morgue file some six feet overhead, the data is finally found reposing on the Engineer's desk—where the secretary had suggested the search begin—only to have the Engineer vehemently and with most injured facial contortions insist that "I gave the data to you—you certainly should know where you filed it".

After several repetitions of the foregoing, in any one day, only an all-male jury would hold the girl guilty of murder if she borrowed the axe from the survey crew and made good use of it.

In order to eliminate brushes with the "law" over hasty actions taken while "sizzling and seething" with indignation over the Engineer's ways, I have found that judicious use of the mechanical aids I now offer for your inspection is a real help in my work.

The short, light riding crop suffices for the office boy, engineers-in-training, and some young draftsman, but for best results on the wind-toughened hides of registered Engineers and chief draftsmen, heavy applications of the eighteen-foot rawhide bullwhip are generally required.

Nothing has yet been found that works well on Consulting Engineers, so all we can do is to hope "Clancy will lower the boom", and we must just continue to suffer in dignified silence until he responds.

The Caterpillar Emerges a Butterfly

Beautiful butterflies emerge from cocoons woven by lowly caterpillars—in much the same manner as the final specifications eventually appear. The rough draft is turned over to the luckless secretary by the omnipotent Engineer in FINAL form, all checked, corrected, initialed, and "ready for stenciling"—albeit words have been omitted, and punctuation has the appearance of having descended as rain from heaven, to fall in the proper (seldom) and improper (consistently) places. This necessitates careful editing on the part of the secretary prior to typing, with the result that the specification turns out very neatly and properly written and the Engineer looks very smug about the whole thing.

After all of the toil, sweat and tears have been expended, the "final" specifications prepared, collated and bound—and the secretary, worn out, thinks she is through with her stint—time 11:30 P.M.—further troubles befall her when the Engineer turns effeminate, changes his mind, and—"wot hoppen"—the whole darn thing has to be done over.

Danvers Loses Roger Esty

Public Works Supply & Cement Lined Pipe Co. the Gainers

With but little time to dash off this item to meet the dead-line for this issue, we have just been advised that Roger W. Esty, longtime Superintendent of Water and Sewerage, at Danvers, Mass., is resigning to accept an attractive position with the Cement Lined Pipe Co. and Public Works Supply Co. of Lynn, Mass.

Roger W. Esty

Mr. Esty has served the Water Department of Danvers for 35 years, having started as a water-boy on construction work. As "Super" at Danvers, Roger Esty's work has attracted nationwide attention and his reputation amongst New England water works men won for him the presidency of one of America's most exacting professional groups—the New England Water Works Association, which since has also elected him to Honorary Membership. Roger Esty has also served as National Director in the American Water Works Ass'n. and has served on important committees of this association and as Chairman of its Committee on Valves and Hydrants.

Mr. Esty, failing to obtain for his employees the promised salary scale which he felt justified in going to the mat for, tendered his resignation as head of the Department which he had served for 35 years. We well know that it was a tough decision to make.

Danvers loss is Cement Lined Pipe Co.'s and Public Works Supply Co.'s gain. Mr. Esty has accepted an alluring offer made by these associated companies, which he will serve as Service Engineer—and "Ambassador of Commerce". He will continue to live in his attractive Danvers home and travel through New England. What could be more pleasant to a man of Roger Esty's attainments and personality; and, few will be those water works men who will not profit from his visits. And, if the net result is an added prestige for the companies he represents all will have profited.

We find ourselves asking the question over and over—"How could Danvers have let this man get away?"

Wheeling to Fluoridate

Another large city is to fortify its water supply with fluoride. The following advice has just been received from A. R. Todd, Sup't. of Purification at Wheeling, W. Va.

At a meeting of Wheeling City Council July 18, 1950, representatives from the Local Dental Society and The State Dental Society presented resolutions endorsing the fluoridation of water and Wheeling Council voted the necessary funds for the purchase of the material and feeding equipment.

It is expected that the Water Department will be ready to start the treatment even before this issue reaches readers.

Longest Man-made Waterway

Now more than 2500 years old, the Grand Canal of China is still the longest canal in the world. It is 1000 miles long.

WATER SUPPLY AND SEWAGE TREATMENT

*The Fourth in a Series of Articles**

by

W. W. ECKENFELDER, JR.
Cons. San. Chemist

JOHN W. HOOD
Superintendent

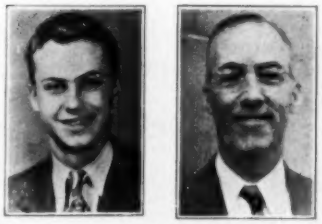
SEWAGE TREATMENT WORKS
RIDGEWOOD, N.J.

THIS paper attempts to evaluate the variations in the characteristics of water supplies particularly as they relate themselves to sewage treatment practice and problems. It has been found that variations in the water supply constituents in different regions of the United States have created problems in connection with the successful treatment of domestic sewage and industrial wastes. The available data on public water supplies in the United States[1] has been cited to assist in the rationalization of treatment problems such as will be used as illustrations. There is a relationship between the strength and character of a sewage and the water which is a predominant factor in its composition. The disadvantages of hard waters in connection with industrial use have been extensively studied but little has been done on sewage treatment despite the fact that in extreme cases the quality of the water supply may well dictate the success or failure of a given installation.

Composition of Water and Sewage

In fresh water supplies calcium, sodium, magnesium and potassium are present; calcium being the most and potassium the least abundant. In addition silica is usually present in waters to varying degrees and smaller concentrations of iron and manganese are also found in natural water supplies. The anions usually present include bicarbonate, sulfate, carbonate, choride and nitrate. In a natural water nitrates are of a low order of magnitude but may reach appreciable concentrations in purified sewage effluents or in streams where sewage is discharged.

Electrical conductivity provides a valuable tool as a measure of the concentration of ionized compounds in a water. Conductivity is defined as the ability of the solution to carry a current of electricity and is a measure of the ions of the electrolyte in solution, the magnitude being largely dependent on the number of ions present. The number of ions is likewise dependent upon the concentration of electrolyte or salt in the case of water, and also upon the degree of dissociation of these salts. In the case of waters generally encountered, the dilute concentration of salts leads to practically complete ionization.



The Authors
W. W. Eckenfelder, Jr. John W. Hood

Experiments at Ridgewood, N.J., have indicated that electrical conductance of the raw sewage entering the plant was higher than that of the municipal water supply. As treatment progressed the conductance decreased again. This indicates that there is an increase in ionized soluble substances in the sewage over the water and that as treatment progresses these substances are either removed or transformed in character. As has been mentioned in a previous article, this includes also the partial transformation of the bicarbonates and carbonates in the water to salts of nitrogen and sulfur through the mechanism of oxidation.

One of the most important aspects of a water supply is its hardness. Excessively hard water may be unfit for industrial use and even when used as a public water supply can create problems such as excessive soap demand which in turn vastly increases the sewage coagulation and treatment problems. Plate 1 of U.S.G.S. Water Supply Paper No. 658[1] shows those regions in which excessively hard water having high soap demand or very soft water having low soap demand are naturally present.

Buswell[2] cites the economic importance of soap waste and soap demand due to hard water. Considering that the B.O.D. of soaps is relatively high[3], substantial increases in soap consumption due to hard water will obviously increase the strength of the raw sewage in terms of B.O.D. and hence the cost of the treatment of the sewage.

Buswell[2] has reported that "the removal of 72 ppm. of hardness from St. Louis water resulted in a saving of $920 of soap per day." In terms of sewage treatment by chemical coagulation for a contributing population of 15,000 the weekday coagulant consumption averaged 800 lb. per 24 hrs., whereas Monday laundry day consumption was 1700 lb. per 24 hr.

Sulphur in Water Supply And Sewage

Sulphur present as sulfate (SO_4) in public water supplies, has been found to range in concentration from a trace up to 1,199 ppm.[1] Natural concentrations of SO_4 are enhanced by the use of aluminum sulfate as a coagulant in the treatment of public water supplies. Acid drainage from mines also is responsible for increased sulfur concentrations. Sulfur in the form of hydrogen sulfide (H_2S) is an objectionable feature of some subsurface water supplies.

When natural or filtered water supplies are used as vehicles in sanitation facilities, the sulfur concentrations are further enhanced by contributions of organic and inorganic character, from contributing population and industry. It becomes apparent that sewage in general will reflect the sulfur concentration of the water supply, which constitutes a major part of its mass. It also is evident that no other single constituent element of sewage is deserving of more consideration and attention than is sulfur.

Sulphuretted hydrogen odors and sewage treatment plants have been intimately associated in the public mind for so long that they have become generally accepted as a some-

*Other articles in this series appeared in March, May and June.

what inevitable combination. Failure of mortar joints, pipes and concrete substructures in sewerage systems and treatment works are found in large measure due to the biological oxidation of hydrogen sulfide, the resulting acid progressively attacking the basic or alkaline constituents of the structures, eventually causing their failure. The "Sulfur Cycle" reproduced in numerous engineering texts, portrays the transformations which occur.

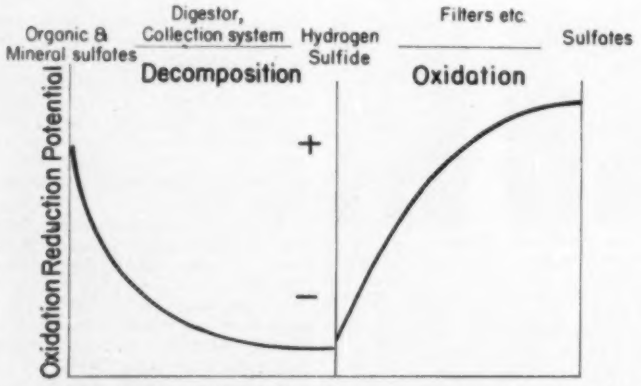


Fig. 1—The "Sulfur Cycle" Through Reduction and Oxidation and its effect on O-R Potential

Sulfide control is of major importance in connection with the operation of extensive trunk sewer lines in warmer regions where structural failure menaces public health and pocketbook. Biochemical reduction of both inorganic and organic sulfur compounds (productive of hydrogen sulfide) occurs in sewage and sewage sludge, when the Oxidation-Reduction Potential (O-R-P) descends to negative values, subsequent to the total depletion of dissolved oxygen[6]. This condition frequently attends the collection and treatment of sewage, because the immediate oxygen demand of the sewage solids exhausts the limited and relatively small concentration of available dissolved oxygen. Control of sulfide evolution may be rationalized through a knowledge of the biological classifications and their related O-R potentials[8]. Likewise, atmospheric conditions may be remedied, and public relations improved through proper application and use of O-R Potential, to attain positive potential values of aerobic classification in treatment works and collection systems. Some contributing causes in sewers may likewise be removed[6].

Accumulations of scum or undigested sludge in sewage treatment digestion tanks is frequently experienced, causing operational difficulties such as obstructed gas domes, overflow and withdrawal pipes. Scum may be the cause of hydraulic rupture of structures[3]. Fire and explosion hazards are encountered when cleaning operations are undertaken. A number of instances are on record where property damage, personal injury and loss of life were incurred. These considerations introduce yet another facet of the role sulfur plays in sewage.

The Carbon:Nitrogen ratio of elemental nutritional requirements for bacteria is frequently considered in connection with biological processes, and appropriate adjustment made where necessary[9]. In 1945, extensive research at Ridgewood, N. J. disclosed that the accumulation of scum or undigested sludge of a nontoxic, decomposable character, was due primarily to a deficiency of sulfur and the accompanying adverse O-R-P values in the process tank. Since that time, scum formation has been effectively controlled by the addition of sulfate to the raw solids entering the process tank.

On the other hand, it has been found that in regions where the water supply is high in SO_4 content, scum formation is not a problem! However, excessive sulfide formation and failure of metallic structures and piping is experienced, indicating that too much SO_4 creates other problems[7].

Sulfate is a readily available source of sulfur for the metabolic and structural requirements of certain anaerobes and also supplies the necessary oxygen. Hence SO_4 cannot remain inviolate in actively reducing and hence negative O-R Potential conditions and is progressively transformed to sulfide in proportion to the concentration of SO_4 introduced, this in turn being mainly a reflection of the water supply.

The Ridgewood, N.J. primary digester is operated at an O-R Potential of -150 to -200 millivolts E_h, as derived by platinum electrode. Fats and grease were found in high concentration in the scum, indicating that the organisms capable of working over such material had definite sulfur and/or sulfate requirements. Locally, troublesome cesspools and septic tanks have been brought under control with supplemental sulfate treatment alone from within the homes. Figure 1 shows the "sulfur cycle" through reduction and oxidation and its effect on O-R-P.

Clarification of Water and Sewage

The principles involved in the chemical coagulation of water and sewage are similar, but generally much higher dosages are required for the successful treatment of sewage. This is in large measure due to the higher concentrations of suspended and dissolved matter found in sewage. However, the coagulation problems of sewage treatment are enhanced by these increases, and frequently result in unsuccessful and uneconomical operation.

Extensive investigation has disclosed that the buffer value of both subjects plays a major role in this connection[10]. This value may be defined as resistance to change in $_pH$. Since chemical coagulation involves both physical and chemical change it emerges that this value will affect both the efficiency and the economy of the process. It will be noted that the buffer value is expressed as pH-alkalinity. Figure 2 depicts the buffer or pH-alkalinity values of the water supply, raw sewage and treated effluent at Ridgewood, N.J. plotted in relation to the carbonate equilibrium curve. The higher buffer value of raw sewage over water supply may be noted; also the fact that successful treatment produces an effluent comparable in value to the original water supply. The second curve depicts the buffer value of the water supply and the raw sewage at a U. S. Army Camp located in a hard water region of the country. The pH-alkalinity value of the water supply at this camp exceeded that of the Ridgewood sewage. The camp sewage increased in pH and doubled in alkalinity compared with its water supply values. Poor treatment results were obtained in this installation,

mainly due to the adversely high pH-alkalinity or buffer values.

Lewis B. Miller, in a paper presented before the Technical Association of Pulp and Paper Manufacturers, February 1939, stated that "in many cases alum performs its function in paper manufacture due to its property of forming gelatinous precipitate with dissolved alkaline materials *under certain conditions.*" His experiments disclosed that "it is with the addition of only a certain intermediate quantity of alkali that the precipitate of alumina forms."

In the treatment of water and sewage, the quantities or concentrations of alkali or alkalinity are not controllable, and as has been shown, are also highly variable both in the water supply and raw sewage or waste. Hence plants of similar design and volumetric capacity may produce widely variable results, depending upon whether the buffer value of the raw subject was favorably low or unfavorably high as illustrated by Fig. 2.

To a limited extent, adverse buffer value may be modified downward through lowering the pH value by precarbonation. A substantial economy was effected on plant scale operations at Ridgewood, N.J. by precarbonation to pH 6.0±, prior to the chemical coagulation step. The changes in coagulant demand of various wastes before and after carbonation with CO_2 preceding the coagulation step have been shown by Hood[12]. Improved clarification results were accompanied by enhanced percentage B.O.D. removals, attaining maximum removals of 85%.

Biological clarification is likewise adversely affected by high bluffer or pH-alkalinity values[13]. Organisms and bacteria are alike inhibited by pH values in the carbonate and caustic zone[13]. Other groups react unfavorably to excessively high concentrations of calcium salts present as bicarbonate alkalinity. Complete failure can result from sustained high values of either or both pH and alkalinity, as for example early British sewage practice employing lime as a coagulant, which not only clarified the subject high in the caustic range, but also produced 98% bactericidal results.

Coagulation difficulties are reflected in the high sulfate (SO_4) values of certain treated waters. The significance of these higher SO_4 concentrations in relation to sewage collection and treatment has already been discussed.

As has been indicated in the previous papers of this series a comparison may be made between the water supply and the sewage plant effluent. The determination of alkalinity, pH and conductivity are useful in this connection.

From the conductivity, as has been mentioned, the change in the total salt character and concentration is indicated. The alkalinity indicates the changes which have occurred due to nitrogen oxidation, the subsequent reaction of the acidic products of this oxidation with the alkaline components of the water and the sewage, and of the other basic components added to the water by the sewage.

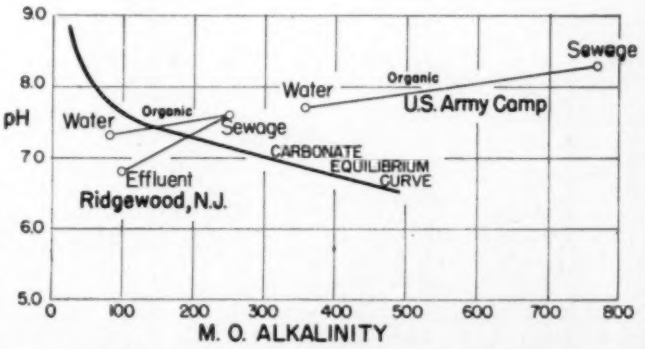


Fig. 2—Relation between pH and Alkalinity of Water Supply, Raw Sewage, and Plant Effluent

In recent years the use of sewage plants effluents by industry has been increasing. This, however, is obviously dependent upon the effluent having a quality satisfactory for the use to which it shall be put and the economic feasibility of using this effluent over a source of water.

Some of the mineral constituents of domestic sewage are valuable as fertilizer while many due to industrial wastes are objectionable. Industrial uses of sewage effluents as cooling water necessitates low quantities of scale forming compounds, suspended matter, dissolved corrosive gases, acids, oil or other organic matter and slime forming organisms.

Hence it becomes important to know the relation between the water and the sewage plant effluent to ascertain the objectionable features of the use of this effluent as a source of water.

In summary, the carbonaceous material will be indicated by B.O.D. or chemical oxygen demand tests, while the composition and concentration of the nitrogen may be evaluated by the use of alkalinity. The details of this measure have been made in the preceding papers of this series.

The dissolved, ionized salts, with respect to their general character and composition may be measured by conductivity.

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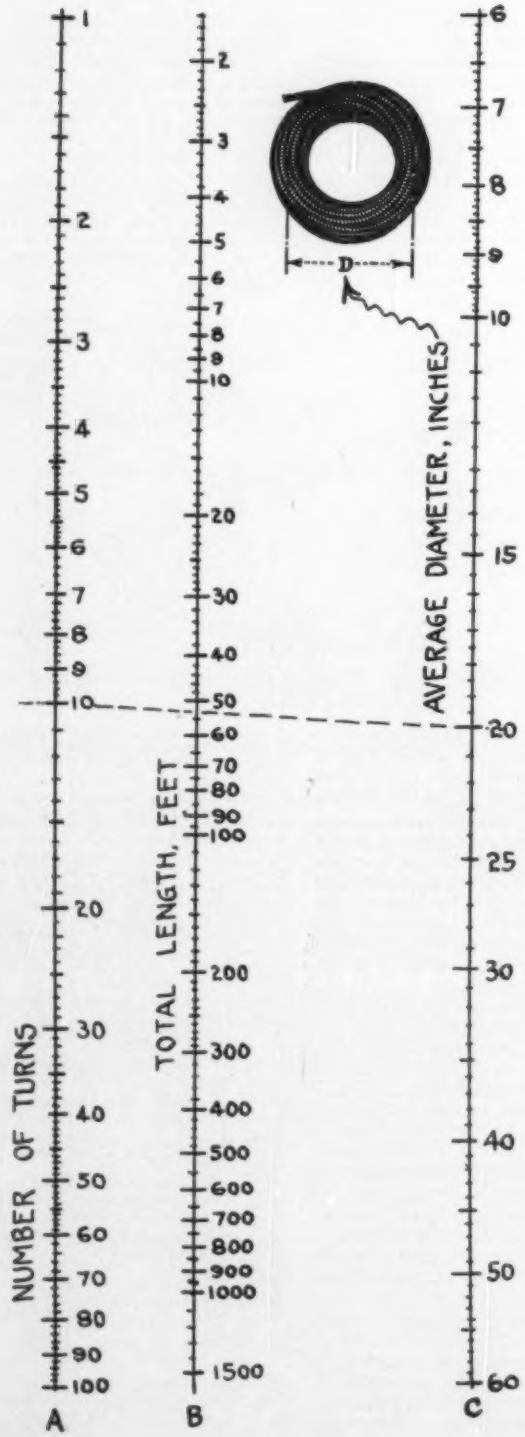

DETERMINING LENGTH OF COILS*

(A Useful Nomograph*)

Anyone who handles wire cable, rope, hose, etc., will find the accompanying chart useful for finding the length in feet of anything that is rolled up, such as rolled-up cable cord, lead pipe, tubing, etc. All that is necessary is to count the number of turns and measure the "average" diameter as shown on the chart, and then lay a straight-edge across the chart as indicated by the dotted line drawn in the sketch. The answer is immediately found in column B.

For example: To find how many feet in a rolled-up cable whose average diameter is 20 in., and in which there are 10 turns, connect the 10 in Column A with the 20 in Column C as the dotted line shows, and the intersection with the middle Column will give the answer—53 feet.

The range of the chart, it will be noted, is large enough to care for most of the conditions to be found in ordinary practice.

The chart can be used "backward" as well. For instance, if it is desired to take along about 300 feet of a coiled up article and the workman wants to know how many turns to take, a straight-edge laid across 300 on the middle scale will tell how large the coil should be made and the number of turns required in order to contain the desired length. Paste this scale on a card and hang it up in a convenient place.

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*Contributed by
W. F. Schaphorst, M.E., Newark, N.J.

N. Y. SEWAGE & IND. WASTES ASSN. MEETING IN JAMESTOWN

A Report

by

HARRY A. FABER*
Editorial Associate
WATER & SEWAGE WORKS

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Buffalo, N.Y.

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Syracuse, N.Y.

THE New York State Sewage Works Association approved, at its annual meeting last January, the change of its name to the New York Sewage and Industrial Wastes Association. The spring meeting of the association at Jamestown, N. Y., June 12 and 13, was its first under the new title. Recognizing the importance of industrial waste treatment problems in the sanitary field, the technical program was designed to include papers of interest to both municipal and industrial representatives.

An inspection trip following the technical sessions provided an opportunity for members to visit the Jamestown sewage treatment plant and the mobile laboratory of the State Health Department. The mobile laboratory is engaged in a study of pollution in the Chautauqua Lake area, as a part of the program of the state Water Control Board.

Presiding at sessions of the meeting were John W. Johnson, President, and John M. MacCrea, Vice President. Hon. Samuel A. Stroth, Mayor of the City of Jamestown, gave the welcoming address at the association dinner. A feature of the dinner meeting was the presentation of awards to members.

Recipients of the 1950 Rating Awards were announced by Clifford E. Irving, Chairman of the Rating Award Committee. For best reports on treatment plant operation the committee selected: JOHN W. JOHNSON, Buffalo, for a plant serving a population over 100 thousand; FRANCIS J. CRAMER, Rochester, for a plant serving a population from 10 to 100 thousand; and WILLIAM L. EDWARDS, Gowanda State Hospital. Messrs. Johnson and Cramer each received an Operator's Cup, while a certificate was presented to Mr. Edwards (who is a previous winner of an Operator's Cup).

The total registered attendance at the spring meeting was 113 of whom 73 were members and 40 were guests.

More Officers

Secretary
R. C. Sweeney
Dist. Engr.
State H'lth Dept.
White Plains, N.Y.

Treasurer
J. C. Brigham
Sr. Engr.
State H'lth Dept.
Albany, N.Y.

The NYS & IWA is fortunate in having Dr. Hess, Buffalo, as Chairman of its Committee on Membership from Industry. Largely through his active interest, there is a steady growth of new members from the industrial waste treatment field.

TECHNICAL SESSIONS

The leading technical session of the two-day meeting was devoted to four papers on various phases of industrial waste treatment. The second was a joint session including papers relating to industrial and municipal problems. An entire morning was devoted to the third session, a panel discussion on operation and maintenance of equipment in sewage treatment plants.

New York State Problems

"WASTE TREATMENT PROBLEMS IN NEW YORK STATE" by R. W. Simpson, Sanitary Engineer, Gilbert Associates, Inc., Reading, Pa.

In his broad review of industrial waste treatment, Mr. Simpson pointed out that the 34,000 industrial plants of New York State—which is first in population but only 29th in area—constitute an acute waste disposal problem. The state is bounded by lakes, rivers, and ocean; it has 70,000 miles of streams and many lakes within its own borders; the problem of pollution control includes, also, discharges to streams, drainage basins, and ocean which are affected by interstate regulatory relations.

Mr. Simpson reviewed the types of waste-producing industries, commenting briefly on the characteristics of the wastes produced, methods of treatment which are applicable, and the extent to which they are employed. Among the industries discussed were: oil refineries, tanneries, milk processing, textiles, canneries, paper mills, packing houses, steel mills, coke and by-products, plating plants, chemical manufacturing, laundries, and fermentation industries.

Water conservation was described as the most essential aid to solving the waste control problem. Other aids are: improved process operation, by-product recovery, and the re-use of plant water. The general methods of treatment, and the need for improved

Arrangements

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special methods, were discussed. The State Health Department and the Water Pollution Control Board are formulating sane and beneficial stream standards in solving the many problems.

Phenols from Coke

"Industrial Waste Treatment —Pilot Plant Operation" by Newell L. Nussbaumer, Engineer, Nussbaumer, Clarke, and Velby, Buffalo, N. Y.

Industrial Waste

R. W. Simpson
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N.Y.

Mr. Nussbaumer described the design and construction of a pilot plant to treat ammonia still (phenol) wastes at a coke plant. Studies are being conducted under the direction of his firm and Dr. George E. Symons, Consultant, for the Donner Hanna Corp. Plant at Buffalo, N. Y. The pilot plant was constructed in 1949 and is operated to determine effective and economical methods by which the industrial wastes of this firm may be treated.

The Donner Hanna coke oven plant processes about 4,200 tons of coal per day, using about 8 mgd. of water (mostly for cooling purposes). There are about 85,000 gpd. of ammonia still wastes, and the problem is largely one of treating phenol and cyanides present in these wastes. At present, the problem is principally that of phenol reduction—the cyanides having been largely eliminated by change in process at the plant. Phenol content of the ammonia still liquor is about 850 ppm., and in the total coke plant effluent is about 20 ppm.

Based on experience of the Dow Chemical Co. waste treatment plant (trickling filters and activated sludge), it appears that a 50 ppm. phenol content is the maximum which may be treated by biological methods. The pilot plant filter described by Mr. Nussbaumer is 10 ft. in diameter and 10 ft. deep; other units in the plant are a settling tank (24 hr. detention), a storage and acid mixing tank, a mixing and recirculating tank where dilution water is added to the returned filter effluent, and an effluent chamber following the filter.

Various operating experiences during 1949 were described: seeding of the filter was first accomplished with settled domestic sewage. Early procedures did not result in the desired reduction in phenol and, in addition, the filter growth was destroyed. Effluent from a septic tank was next used to seed the filter, but results were inconclusive because the coke plant was shut down by a strike.

The pilot plant was again placed in operation in early June, 1950, and the seeding procedure is now taking place using Buffalo River water with some septic tank effluent. The Buffalo River water contains about 0.1 to 0.2 ppm. phenol and may provide a more satisfactory seeding material than that previously employed.

Phenols from Plastics

"Treatment of Phenolic Plastics Manufacturing Wastes" by Norbert H. Kirchgessner, Chemical Engineer, Durez Plastics and Chemicals, Inc., North Tonawanda, N. Y.

Mr. Kirchgessner cited an impressive example of how one plant in the chemical industry has successfully attacked its waste problem. The Durez company manufactures protective coating resins, industrial resins, molding compounds and their basic raw materials (phenol and formaldehyde). Process wastes and cooling water are discharged to the plant storm sewer system. Sanitary wastes are discharged to a separate system. These sewers join the North Tonawanda combined sewer system at the edge of the plant property and, at present, the municipal sewers discharge to the Niagara River without treatment. Total plant waste waters are about 3 mgd.

The Raschig process for phenol production results in a minimum of by-products and of process wastes. Wastes are principally polychlorinated benzenes, hydrochloric acid, caustic wash solution, and tar. The benzenes are recovered by distillation and are disposed of as crude dichlorobenzene. The hydrochloric acid, about 2,000 lb. per day, is neutralized with lime and is discharged to the sewer. As this acid contains about 0.2 per cent phenol, a continuous filtration and evaporation process for phenol removal is being investigated. Caustic wastes may be continuous or periodic; they will be collected and sent to the phenol recovery plant when a pH treatment system has been added. The tars are disposed of by burial in dump sections of the plant property.

Distillate containing a high percentage of phenol is produced in the manufacture of certain resins. The distillate is accumulated and run through a batch still, thus removing several thousand pounds daily of phenol and tar from the wastes. In the manufacture of other resins low phenol content distillates are produced; a Raschig extraction process is used to recover the phenol which

Industrial Waste

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White Plains, N.Y.

was formerly discharged to the sewer.

Since 1942, about $150,000 has been spent at this plant to reduce the pollution load discharged. If these steps has not been taken, there would now be about 7,000 lb. of phenol per day discharged to the sewer. When present plans are completed there will still be some wastes having a very low phenol concentration (about 1 ppm.) for which no satisfactory treatment is known.

Regulating Industrial Wastes

"Regulation of Industrial Wastes Entering County Sewers" by James C. Harding, Commissioner of Public Works, County of Westchester, N. Y.

Mr. Harding described the development of the first set of rules and regulations to be enacted by a county agency in New York State. These are of particular interest because of present investigations being conducted by the new Water Pollution Control Board with reference to municipal and industrial wastes. Thomas Riddick, Consulting Engineer of New York, was largely responsible for the development of the specifications.

A printed pamphlet of 12 pages, issued by the County of Westchester, includes a complete discussion of instructions for preparing and submitting applications for connections to County sewers, requirements and specifications for design and construction of such connections, and the rules and regulations which govern discharge of sewage, industrial wastes

and other wastes into the sewers. A copy of this excellent pamphlet should be a very useful model for consulting or designing engineers, and for officials of municipal or industrial waste treatment plants. Copies may be obtained from Mr. Harding.

The general purpose of the rules and regulations is to prohibit the discharge of sewage or waste into County sewers when it will cause sewer maintenance difficulties, sewage treatment plant operating problems, or excessive

Stream Pollution

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expenditures for treatment. Standards applying to industrial wastes are of particular interest: the Department of Public Works determines maximum allowable volumes and rates of flow; it may require provisions for flow measurement and detention tanks; limits are set for acceptable solids, viscosity, temperature, color, and chemical characteristics. Mr. Harding devoted his discussion largely to experiences in securing cooperation in the regulation of industrial wastes, as these present the largest and most varied problems.

Stream Classification

"Classification-Standards System for Waters of New York State," by A. F. Dappert, Executive Secretary, N. Y. State Water Pollution Control Board, Albany, N. Y.

As a result of several months of intensive work the Water Pollution Control Board has developed proposals for a general state-wide system of classes and standards applicable to all waters of the State. The tentative proposals have been extensively reviewed by several hundred technical experts and others who are in agreement that the proposed system is sufficiently satisfactory to be considered for adoption.

Mr. Dappert discussed in detail the classification standards, using lantern slides for illustration. Standards are based upon considerations of the best usage of waters in the interests of the public: seven classes are proposed for fresh surface waters; four classes are proposed for tidal salt waters; and two classes are proposed for underground waters.

The proposals to be considered at public hearings, if adopted, will not fix the classification or standards of quality for any specific waters. The effect will be to indicate that when any specifically designated waters are classified in the future, such waters will be assigned to one of the proposed classes. Prior to classification and assignment of standards of quality to any specific waters, the law requires studies to be made of such waters, and public hearings to be held on due notice. The discussion at these public hearings will deal, not with any specific waters, but with the suitability of the proposed classes and standards to be followed in later classification of waters. Hearings of two-day duration were being scheduled (during June) at convenient locations in many parts of New York State. Printed copies of the proposals may be obtained from the Water Pollution Control Board.

Mobile Laboratory

"Operation of Field Laboratory Unit in Water Pollution Surveys" by W. W. Sanderson, Assoc. Sanitary Chemist, Division of Laboratories and Research, N. Y. State Dept. of Health, Albany, N. Y.

Mr. Sanderson described the part taken by the laboratories and research division in water pollution surveys. These surveys are a necessary and important part of setting classification-standards for waters of the state. It is estimated that a period of 10 years will be required for their completion.

Space and facilities have been provided in the Albany laboratories for analyses of those constituents in water which do not change with the age of samples. This laboratory staff includes one senior and two junior sanitary chemists, and one technician. The mobile laboratory, for analyses which must be made in the field, is staffed by a sanitary engineer, a sanitary chemist, and two aquatic biologists. Space in the mobile laboratory (one borrowed from the U. S. Public Health Service) is inadequate for the present purpose, and a new mobile laboratory (a trailer unit 28 feet by 7 feet inside) is being constructed to meet the needs of the Division for these studies.

Samples, collected and brought to the mobile laboratory, are selected to evaluate pollution and to measure changes in the stream after pollution is added. The tests made are determined by the constituents present in specific wastes. In 1949 studies of the Rondout watershed, samples averaged six per day and, in the studies this year of Chautauqua Lake, the samples average seven per day. The Secretary of the Water Control Board determines the order in which streams will be surveyed.

Sewer Rental Financing

Two papers were presented on the subject of sewer rental financing, one relating to experiences in a small and one in a large community. As this

Rates

J. J. Joyce, Jr.
Exec. Secy.
Bflo. Sew. Auth.
Buffalo, N.Y.

Operation

Uhl T. Mann
Supt.
Ley Creek Tr. Pls.
Syracuse, N.Y.

method of financing has a very limited use in New York State, the satisfactory results reported in these papers should be of wide interest.

"Sewer Rental Financing in a Small Community" by Frank Nollett, Supt. of Utilities, Bath Electric, Gas and Water System, Bath, N. Y.

This small agricultural village has gradually developed or purchased electric, gas, water, and sewage utilities. Under a five man municipal commission, the sewerage and sewage treatment utility was developed in 1936 for a design population of 5,000. At the time its method of sewer rental financing was developed there was practically no background of experience in New York state.

The sewer rental rate is based on metered water charges. In the original rate, maintained to the present, the quarterly charge for the first 15,000 gal. is $1.30 net (and this is the minimum charge). Net rates decrease with large consumption to as little as 1.8 cents per thousand gallons. These rates, set in 1937, now furnish only about one-half of the operating cost and will soon be increased. Mr. Nollett reported the system to be a very satisfactory one, and to be generally approved by residents. In reply to a question, he stated the minimum water rate charges to be $3.40 per 10,000 gallons.

"Sewer Rental Financing in a Large Community" by John J. Joyce, Executive Secretary, Buffalo

Sewer Authority, Buffalo, N. Y. Mr. Joyce explained the somewhat more complicated system of sewer rental financing employed by the Buffalo Sewer Authority. Greely and Hansen, consulting engineers of Chicago, devised the system employed: 45 per cent of the revenue requirement is derived from water use, and 55 per cent is derived from assessed property valuation.

About $462,000 is obtained from metered sewer users and about $461,500 from non-metered users and approximately $950,000 from property assessment. Special charges for those using other than Buffalo water and contributing sewage were discussed, as was the "Buffalo Formula" (developed by Symons and Crane) of special charges applying to industrial wastes. Collections are reported to average better than 96 per cent, and it is expected that the 1950 budget of $1.864 million will be met from revenue. Experiences cited by Mr. Joyce indicated the method employed in financing (in use for twelve years) to be acceptable and successful.

Jamestown's Problems

"The Future of Sewage Treatment at Jamestown" by Benjamin Schwartz, Director of Public Works, Jamestown, N. Y.

The need for improved sewage treatment is considerable, according to Mr. Schwartz, but present plans are uncertain. Mr. Schwartz became director of public works in April, 1950, and inherited the sewage treatment problem. The present primary, Imhoff, and chlorination plant is now inadequate.

The question is whether the old plant shall be extended, or whether a new plant shall be constructed in another location. If the former is done, replacement of a 36 inch trunk sewer will be required; if the latter, a suitable location will be difficult to find. While blueprints were prepared for an activated sludge plant and a site was purchased by the city during the last war, the City Council has since voted to abandon the location and to sell it for industrial purposes. Objections to the site included its high industrial value, its potential odor nuisance, and the necessity for discharging treated effluent through an adjacent town. Extension of the old treatment plant now appears to be the best solution, but no decision has been reached.

Panel Participants

Sludge Collectors
N. S. Snyder
Sales Engr.
Link-Belt Co.
Buffalo, N.Y.

Chlorinators
R. J. Weisbeck
Serv. Engr.
Wallace & Tiernan
Buffalo, N.Y.

F. J. Cramer
Supt.
Sew. Treat. Plant
Town of Greece
Rochester, N.Y.

Also Present

Ralph Bates
Assoc. San. Engr.
State H'lth Dept.
Albany, N.Y.

J. J. Horgan
Sales Mgr.
R. B. Carter Co.
Hackensack, N.J.

G. F. Fynn
Chief Chem.
Bflo. Sew. Auth.
Buffalo, N.Y.

Panel Discussion of Equipment

"Operation and Maintenance of Equipment in Sewage Treatment Plants": a panel discussion presided over by Uhl T. Mann, Supt., Ley Creek Sewage Treatment Plant, Syracuse, N. Y. This discussion was planned to answer practical problems of operation and maintenance in a practical manner. In order to do so, equipment manufacturers were invited to assign experienced maintenance and service technicians; these panel participants provided explicit answers to the most frequently encountered problems.

Participants included:

Louis F. Nemesch, Service Engineer, Ralph B. Carter Co., Hackensack, N. J.

Ralph S. Carter, Service and Installation Supervisor, Chicago Pump Co., Chicago, Ill.

C. G. Frei, Service Engineer, Apparatus Service Shop, General Electric Co., New York, N. Y.

Stanley Snyder, Sales Engineer, Link Belt Co., Buffalo, N. Y.

Richard J. Weisbeck, Sales and Service Engineer, Wallace and Tiernan Co., Buffalo, N. Y.

Electric Motors. The best methods of electric motor maintenance were discussed by Mr. Frei: preventive maintenance programs are most effective; low operating temperatures extend the life of the motor—a 20 year life may be obtained when operating temperature is below 90°C, and only a 10 year life of insulation at 98°C.

Chlorinators. According to Mr. Weisbeck, routine attention to chlorinators in small sewage treatment plants should include: cleaning of screens in the water supply line; replacement of hard packing in stuffing boxes; cleaning of glass parts; and general maintenance of the machine—if appearance of the equipment is good, it indicates that chlorine leaks are being prevented.

Pumps. Ralph S. Carter discussed the recommended procedure for starting pumps: check freedom of movement; align couplings, especially after connections have been made; packing glands should be a little loose, so that water drips out at about 60 drops per minute; check for proper rotation after the pump is started; check gage readings; and keep the pump clean, even if sewage is being handled.

Plunger type pump operation was reviewed by Louis F. Nemesch: never use worn packing, and preferably use Superior packing; if molded type packing is used, satisfactory operation may extend over a 2 year period instead of requiring replacement two or three times each year; but if packings are used which retain abrasive materials, frequent change of packing is desirable.

Sludge Collection. The operation of straight-line sludge collecting equipment, according to Stanley Snyder, involves: following manufacturers' recommendations for proper oiling, particularly of speed reducers; scrapers should be protected against rust if long out of service; and lubrication of chain links or ball bearings is generally not necessary.

Many other items were discussed by the panel participants, and the many questions from the audience indicated the general interest in the discussion of operation and maintenance problems.

TREATMENT AND DISPOSAL OF CYANIDE BEARING WASTES*

by

JOHN E. TARMAN, Director
MAX U. PRIESTER, Assistant Director

Consulting Division
W. H. AND L. D. BETZ
PHILADELPHIA, PENN.

SEVERAL types of industries produce industrial wastes containing cyanides. This paper will discuss a selected list of plants to show the diversity of treatment problems which may be encountered in treating cyanide bearing wastes due to the particular plant operations and specific sources of those wastes as well as other wastes which may emanate from the plant. All of the plants discussed have been constructed and are presently operating, and represent a partial list of those with which our firm has been associated for design of treatment procedure, supervision of operation, or both.

The specific problems presented will be discussed, the treatment system and facilities described and operating results presented on each of four plants.

Effects of Cyanides

The effects of cyanide bearing wastes on fish life in the receiving streams is well known. While the effect of these wastes on the operation of sewage treatment plants may be somewhat less generally recognized, it is none the less important. Secondary biological treatment methods as customarily employed in sanitary sewage treatment may handle satisfactorily small concentrations of cyanide, effecting its oxidation to such extent that the treated effluent will not be harmful to fish life in the receiving stream. If the concentration of cyanide is too high, however, the efficiency of the biological process may be seriously impaired, with excessive cyanide concentrations resulting in a complete breakdown of the normal biological process.

The detrimental effect of cyanide either on the receiving stream or on a sewage treatment process is a function of both the pounds of cyanide discharged and the available dilution in the stream or in the receiving sewer. Cyanide bearing wastes may therefore present a serious problem in a small industrial establishment as well as a large one, depending upon the pounds of cyanide in the waste and the dilution available.

*Paper presented at the 5th Purdue Industrial Waste Conference and here published by permission.

PLANT A

In line with the tendency for location of industrial plants in suburban areas, Company A decided to construct a new plant in such an area and abandon a plant then being operated within a city. Under Pennsylvania law, this was classified as a new industrial establishment and therefore required to treat its industrial wastes, having treatment facilities ready for operation at the time the plant was initially operated. The location selected was above a public water supply, therefore requiring complete treatment of the wastes prior to discharge into the receiving water. Owing to the fact that the location was in a suburban community, the existing municipal treatment plant could not absorb this added load. Treatment facilities at the industrial establishment were therefore required.

Operations at this plant consisted of cleaning and plating of small metal parts. The wastes originated from alkaline and acid cleaning operations, sludge from a solvent degreasing process, and tumbling barrel operations. Copper, nickel, cadmium, and aluminum electrolytic plating were proposed. No chrome plating was contemplated.

The data required for design of the waste treatment plant could obviously not be obtained at the proposed location, so that it was necessary to study the then existing city plant, making such allowances and modifications as indicated by process modifications then contemplated.

New Plant Designed

Since an entirely new plant was involved, it was relatively simple to accomplish such waste segregations as were deemed desirable from the standpoint of treatment. This problem was therefore given appropriate attention in the layout and design of plant sewers. The cleaning wastes were separately collected for primary treatment to accomplish removal of oils and greases. Following this preliminary treatment, they were admixed with the plating rinses. Clean waters, such as used for cooling purposes and which uses did not result in contamination, were collected separately and discharged to the storm sewer. Sanitary sewage from the plant was separately collected and introduced into the municipal sewer.

The stream in the vicinity of the plant was small and flowed through private property for considerable distances before meeting a larger stream. If the treated wastes were to be discharged to this stream, therefore, a high degree of perfection of treatment and operation of the treatment facilities would be a necessity. Owing to the fact that operation of any waste treatment plant is contingent upon the human element, and since the total daily waste flow was anticipated to be small, provision was made for discharge of the treated wastes to the municipal sanitary sewer system. The treated municipal sewage outfall was also so located as to minimize local nuisance by discharging down stream from the critical area described above.

The cleaning wastes are separately conducted to the treatment plant site. Acid is added to accomplish "cracking," the mass agitated with air and the oils and greases which separate and float are skimmed off. The clarified wastes are then mixed with the plating wastes for subsequent treatment.

Operation

The mixed wastes are admitted to one of four 5500 gal. tanks for batch treatment. These tanks have a dished bottom, multiple outlets and are equipped with a paddle type agitator having a sludge scraper blade. The flow was anticipated at approximately one tank per operating day. A solution of calcium hypochlorite is then added in sufficient quantity to yield a stable residual of approxi-

mately 1 ppm. chlorine by the OTA test.

Following this addition, sulfuric acid is added to reduce the pH to 8.0, at which point coagulation results from the solids and alkalinity in the mixed wastes. It is occasionally necessary to assist this coagulation by the addition of ferric sulfate. The mass is then agitated and allowed to settle, and the supernatant liquid is tested to assure the presence of free chlorine. If the test shows satisfactory, the supernatant liquid is decanted to a receiving basin from which it is discharged through an orifice over 24 hours at a low rate of flow. This discharge is to the municipal sanitary sewer.

The settled sludge is withdrawn from the bottom of the tank to a sump and pumped to lagoons. Clear supernatant liquor in those lagoons which results from settling and further compacting of the sludge is returned to the treatment plant as raw waste for retreatment.

One lagoon is reserved to receive oil skimmings from the acid treatment of cleaning wastes. In an emergency, an entire batch of wastes could be discharged to one of the lagoons and later returned for retreatment. During extreme variations in waste composition the lagoons can be used as an equalizing basin for the raw waste in the interest of simplification of the treatment procedure.

It will be noted that several factors of safety are incorporated in this design and no operating contingency is anticipated which would require dumping raw or improperly treated wastes into the receiving sewer.

Results

This plant has been in operation more than a year. The cyanide content of the raw wastes averages approximately 85 ppm. The treatment results in reducing this concentration to "zero." A test on the final effluent by the OTA method is made on each batch prior to discharge and the treatment is so controlled as to yield a chlorine residual test in the range of 2 to 5 ppm. Toxic metals are removed in the coagulation process, and no deleterious effects have been reported on the municipal sewers or on operation of the municipal sewage treatment plant as a result of this installation.

The present plant load is in excess of twice that originally anticipated, so that at least two tanks are treated each day. This is accomplished with 8 man hours per day of labor.

While the plant was designed and is presently operated using calcium hypochlorite as a source of chlorine, the present flow would justify the use of a gaseous chlorinator with caustic if needed to maintain the pH above 8.5. If present efforts at reducing the waste flow are not successful, the feed of gaseous chlorine may be seriously considered in the interest of economy of operation.

PLANT B

Company B decided to relocate its manufacturing plant and purchased an existing building equipped with certain service facilities. Under the Connecticut law this was classed as a new industry and its industrial wastes must therefore be treated, even at the time of initial operation.

Included with his plant was a primary type sanitary sewage treatment plant. This plant had been adequate for the former plant owner and was considerably oversized for the anticipated plant population of the new owner. The plant is located on a relatively uncontaminated stream, with no municipal sewers available in the area. Its waste treatment installation must therefore be complete.

Operations at this industrial plant comprise cleaning and plating of metal parts. The wastes originate from alkaline and acid cleaning operations, tumbling barrels and brass, bronze, cadmium, nickel, and zinc electrolytic plating. No chrome plating is used.

Wastes Segregated

Plant sewers were so arranged that plating and allied wastes containing cyanide were segregated. The cyanide content of these mixed wastes varied from a maximum of 200 ppm. down to a very low figure.

The wastes at this plant consist of three substantially different types, and it was deemed expedient and practical to treat each type individually and separately.

Miscellaneous scattered wastes originate in many parts of the plant and contain no toxic materials, the contamination being principally alkalinity, oil and suspended solids. Concentrated plating room wastes are batched dumped periodically as necessary to the operation. Cyanide bearing wastes are continuously produced in the plating operations.

The miscellaneous scattered wastes are conducted to the existing sanitary sewage treatment plant through existing sanitary sewers. Facilities are provided for neutralization of these wastes with acid if necessary to facilitate oil separation. While the original sedimentation tank was not so equipped, an oil skimming device has been installed to permit removal from the tank of separated oil.

The concentrated wastes which are batch dumped are hauled to a lagoon in a portable tank after proper neutralization, depending upon the type of waste. This includes acid treatment of highly alkaline wastes, alkaline treatment of acid wastes, and treatment of cyanide wastes with chlorine.

Treatment of Wastes

The cyanide wastes which are continuously flowing are discharged by gravity to a collecting well. A transfer pump delivers these wastes to one of three 20,000 gallon concrete tanks. Each of these tanks has a hopper bottom, multiple outlet and conical inlet distributor. Each tank is equipped with a propeller type agitator. The anticipated waste flow was approximately one tank per operating day.

A solution of caustic soda and gaseous chlorine are added to the wastes as they enter the batch treatment tank. A portion of the total waste flow is used as operating water to the chlorinizer. A glass electrode pH recorder is installed in the inlet line to the batch treatment tanks so that the feed of caustic soda solution can be maintained at a proper point to yield the desired pH value.

When the tank is filled, it is agitated for mixing purposes and the wastes tested. A chlorine residual by the OTA test of 2 ppm. or higher and a pH value of 8.5 or above is considered satisfactory treatment. If the tank contents meet these control test standards, the contents are thoroughly agitated, then allowed to settle. The supernatant liquor is decanted to the storm sewer, with sludge discharged to drainage beds.

Owing to the low suspended solids content of these wastes, it has not been necessary to draw sludge each time a treatment tank is used.

Underdrains from the drainage beds lead back to the raw waste well for retreatment of the drained solution.

If the control tests made on any tank show that its contents are not properly treated and do not meet the control standards, its contents are recirculated by means of transfer pumps to permit the addition of caustic soda solution and/or chlorine as needed. This recirculation is continued until the control tests indicate satisfactory treatment.

Operation Results

The waste treatment facilities have been operated since April, 1949. Thus far retreatment as described above

has never been found necessary, the operators having learned by experience how to control the chemical additives to produce proper characteristics. Facilities are available, however, for retreatment when it should ever be necessary. By this means, dumping of untreated or improperly treated wastes is not anticipated.

The cyanide content of the wastes undergoing treatment range widely up to 200 ppm. This is reduced by the treatment process to "zero." Toxic metals are removed in this process. No complaints have been received regarding downstream conditions of the water receiving these treated wastes.

The quantity of cyanide bearing wastes undergoing treatment in this plant is in excess of twice the amount anticipated originally. During the day shift, the operator spends approximately 4 hours at the cyanide waste treatment plant and 4 hours at the sewage treatment plant. On the second shift, a total of one hour labor is involved, solely at the waste treatment plant. This amounts to 5 man hours per day for the cyanide treatment, and 4 man hours per day for the sanitary sewage and scattered wastes treated with the sewage.

The chlorine consumption averages in the range of 30 lb. per day. The major portion of the waste flow occurs in 16 hours.

PLANT C

Company C embarked upon a program of expanded operations which would result in the discharge of a new type of industrial wastes. Under the Pennsylvania law they were therefore obligated to provide treatment facilities for those wastes prior to inauguration of the expanded operations. The plant is located above a public water supply and a recreational area, so that a high degree of treatment is a requisite. The waste was expected to be of such a nature as to be not acceptable in the municipal sewer. The plant was therefore required to construct and operate its own complete treatment facilities.

The expanded operations were to produce wastes from alkaline and acid cleaning operations, surface preparation and enameling of pressed metal plumbing fixtures. Aluminum window sash were also to be subjected to the Parkerizing process.

Cyanide Wastes Segregated

The plan provided for segregation of all cyanide bearing wastes. Cleaning and spray booth wastes were also to be separately collected and delivered to the treatment plant site. Sanitary sewage originating in the plant is conducted directly to the municipal sewer.

The industrial waste treatment problem therefore resolves itself into separate treatments for cyanide bearing wastes and wastes from cleaning and spray booth operations which contain solids in suspension.

The cyanide bearing wastes are separately conducted to a receiving sump at the treatment plant site. This sump is allowed to fill for batch treatment. A circulating pump is provided which passes a stream of this waste through a gas chlorine feeder, with a solution of caustic soda fed to the suction of the circulating pump. This circulation is practiced until a stable chlorine residual is built up. The sump is equipped with an agitator to assist in mixing its contents. When tests indicate the stable chlorine residual to be present, the wastes are then admitted into a mixed waste receiving sump.

Other wastes from the cleaning and spray booth operations are, as indicated above, separately collected and delivered to the treatment plant site, being admitted to the mixed waste receiving sump into which the pretreated cyanide bearing wastes enter. The mixed wastes then flow by gravity to one of two receiving basins equipped with agitators. They are pumped to one of two 100,000 gallon wood stave tanks, each equipped with three stage propeller agitators and swivel joint floating outlet.

Chemical Treatment

When the treatment tank is full, its contents are agitated and sampled for laboratory jar tests with lime and alum to determine the appropriate coagulation dosage.

When the coagulant dosage has been determined, a portion of the wastes from the 100,000 gallon tank is returned by gravity to the receiving basin previously described and into which the raw wastes enter prior to delivery to the 100,000 gallon tank. This receiving basin is now used in this operation as a mixing tank and is equipped with an agitator.

Operation of the agitator is started and the quantity of chemicals determined by the laboratory jar coagulation test is added dry. In other words, the wastes themselves are used to make the solution or slurry of the treating chemicals rather than add water which would increase the volume of wastes for ultimate discharge. When the chemicals have been dissolved, the mixture is pumped back to the 100,000 gallon tank, its contents agitated for mixture and coagulation, then allowed to settle. The supernatant is tested and if found satisfactory, the supernatant is discharged to the storm sewer through the swivel joint floating outlet. If the treatment is not satisfactory, the chemical dosing procedure is repeated until satisfactory results are obtained.

The settled sludge is discharged to a lagoon, from which settled supernatant liquid is returned back to the mixed waste sump for retreatment.

The plant manufacturing facilities are in only preliminary operation, so that preliminary operation of the waste treatment facilities is in effect and has been approximately 2 months. The cyanide content of the cyanide bearing portions of the wastes is in the range of 50 ppm. and is reduced to "zero" by the treatment process.

Cyanate Also Present

Owing to the size of the articles treated at this plant, the cyanide bearing solutions are sprayed on to the work. This results in a certain amount of oxidation of cyanide to cyanate. The quantity of chlorine required is therefore part for oxidation of cyanide as such and part for oxidation of the cyanate radical. In order to arrive at the estimated chlorine dosage, a test for cyanide is made on the mixed wastes. The concentration of cyanate is calculated owing to the complexity of a reliable test method by subtracting from the total amount of cyanide added to the process the amount of cyanide found in the wastes. Admittedly, this method may yield a slightly higher apparent requirement than will actually be needed, but any error will be on the side of safety.

The chlorine dosage calculated by this method is added in the manner described above, and a test then made for a stable residual by the OTA method. A chlorine residual in the range of 1 ppm. is deemed satisfactory.

The mixed wastes are satisfactorily clarified by the procedure employed, and alum and lime have been found satisfactory as coagulants in the operations to date. If required, other coagulants can easily be used because of the method of manual addition of the dry chemicals. Coagulation is carried out near the neutral pH point, this having been found to be the most satisfactory range.

No complaints have been received regarding downstream conditions

due to operation of this plant. Laboratory jar tests have been found dependable, it being rare when it is necessary to retreat a batch of wastes.

The total waste flow is found to be approximately as anticipated. As mentioned above, the waste treatment plant is not yet in complete operation owing to the fact that processing operations at the plant are not in full scale production.

Eight man hours per day of labor is presently used to accomplish treatment of the wastes. Space is provided and arrangements made in the design for the future addition of one 100,000 gallon tank if operating experiences indicate the necessity for such procedure.

Since the treatment system is by batch operation, it is expected to be satisfactory for treating wastes from this plant even with some changes in plant processing operations which may occur. The facilities should prove adequate and the only modifications would be in treatment procedures or chemicals employed.

PLANT D

Company D has, for a number of years, operated a ferro-manganese blast furnace on a small stream in Pennsylvania. Cyanides are constituents in the blast furnace gas. Attention of the State authorities was focused on this plant due to a fish killing which occurred down stream, and analyses of the dead fish showed the presence of cyanide in the meat.

This plant previously scrubbed the blast furnace gas with water for removal of solids. This resulted in the solution of cyanides in the water so used. A treatment process was developed a number of years ago and used at this plant comprising coagulation of the scrubber water with ferrous sulfate and discharge of the treated water into a series of very large ponds for settling. The retention time in these ponds was a matter of several days, with overflow of supernatant liquor from the final pond and discharge to the adjacent stream.

Dry Process Gas Cleaning

The system of blast furnace gas cleaning was recently changed to the removal of the solids by dry process, thus avoiding the use of water in its scrubbing. This change resulted in reduced heat loss since the temperature of the gas is not reduced by the dry process to the same extent that it is in the wet scrubbing operation. Also, cooling waters used around the furnace showed cyanide to be absent by test so that it was expected that the cyanide disposal problem had been eliminated.

The previous practice of discharge of the waste waters through the lagoon system was, however, continued. As a result of a number of years operation of the ferrous sulfate treatment process, substantial accumulations of sludge in the bottom of the lagoons had resulted. Owing to the shape and physical dimensions of the lagoons, removal of this sludge was not deemed practical, so that the present cooling waters came in contact with this previously settled sludge. The lagoons served no apparent present purpose other than accomplishing some cooling of these waters prior to their admission into the receiving stream.

Ferrocyanides from Lagoons

The banks of the pond were formed from blast furnace slag which had been dumped in the area over an extended period of time. Slag piles so formed are somewhat porous and a number of points were noted along the stream bank where seepage of water from the adjacent lagoons occurred. Analysis of this seepage revealed it to be substantially free of cyanide but containing ferrocyanide. Since neither cyanides nor ferrocyanides were present in the cooling waters presently entering these lagoons, their presence in the seepage was attributed to a pickup by contact with or passage through the sludge settled in those lagoons from previous operations. State authorities conducted tests which indicated that, in the presence of sunlight, ferrocyanides present in the stream would be converted to cyanides which would have a toxic effect on fish life and could result in the killings reported.

Cooling Waters Bypass Lagoons

Since the source of this problem apparently was contamination of originally clean waters by the use of the lagoon systems, it was concluded that the contamination could be avoided by by-passing the lagoon system and discharge of the clean cooling waters direct to the stream. This procedure would, however, require some provision for reducing the temperature of these waters since the amount of diluting water present in the stream was not sufficient, at least during the Summer months, to absorb this heat load without elevating the stream temperature to such point that fish life would be impaired by temperature, and perhaps oxygen reduction.

Certain other waste waters originated at this plant from operation of a hot process lime soda softener and from blowdown of the boilers. The major portion of the sanitary load was separately handled through septic tanks and leaching wells, but one sanitary station was not so connected. The boiler room wastes and this small sanitary load were obviously not suited for direct discharge and other means for their disposal needed to be devised.

An induced draft cooling tower, similar to those used in cooling power plant condenser waters was installed. This tower has a capacity of 1,000 gallons per minute and receives the uncontaminated cooling waters only. The tower is equipped with a two speed fan in the interest of economy of operation at various wet bulb temperatures prevailing seasonally. The purpose of the tower was to cool these clean waste waters sufficiently to yield a satisfactory stream temperature from the standpoint of support of fish life. The cooling tower effluent waters are discharged directly to the stream, the tower actually being constructed within an enlarged section of the stream bed. Gravity discharge of the wastes to the tower is therefore possible.

Ponds 1 and 2 are the most remote from the stream bank and do not have any outlet connection to the stream. Wastes from the water softener and boiler room together with the one sanitary station were estimated at 20,000 to 30,000 gallons per day. They are separately collected and admitted into lagoons 1 and 2, alternately. When one lagoon fills, discharge will be directed to the other, allowing the first to dry through underground seepage and solar evaporation, following which any accumulated sludge will be manually removed, preparing that lagoon for return to service when the second becomes filled. Discharge of these wastes to the stream is thereby eliminated.

This disposal procedure as described has been in operation for approximately two months. Tests show that no cyanide is entering the stream and, since the pond system has been abandoned, it has dried up and seepage from the ponds to the stream has stopped. This has avoided the entrance of ferrocyanides into the stream as well.

Operation Results

The induced draft cooling tower is accomplishing a satisfactory temperature reduction and stream conditions are satisfactory. Hot waters entering the tower are in the range of 130° F. and the tower accom-

plishes temperature reductions, dependent upon wet bulb temperatures prevailing, to at least 90° F. Recording thermometer bulbs are installed above the dam which is upstream from the point of waste discharge, inlet to the cooling tower and some 100 feet downstream from the point of entrance of the cooling tower effluent. Continuous records of the operation of the tower and stream conditions are thereby obtained.

The solids bearing wastes are impounded and lagooned as described, the stream showing no evidence of any entrance of those wastes.

The only labor charge for operation of this system is for the required periodic oiling and maintenance of the cooling tower and periodic cleaning of settled sludge from ponds 1 and 2. Power for fan operation represents an operating cost.

GENERAL COMMENT

The importance of a thorough investigation of the plant processes producing cyanide bearing wastes cannot be over emphasized. Maximum economies in the treatment can only result from such a study.

Many plants are reluctant to consider or make any process modifications or changes in plant practice until the costs of treating wastes on a presently existing basis are known. Plant management will, however, frequently find a way to accomplish the required modifications when the economies of such a procedure are pointed out.

Substitutes for Cyanide

For example, one company which manufactures and plates small metal parts found it possible to substitute chemicals in process for the cyanide previously used. This substitution resulted in obtaining a waste which was more readily treatable at a lower total cost than would have been involved in waste segregations and separate treatment stations which would have been preferable had no changes been made.

In another case, a plant using the electro plating process on chain previously used approximately 40 gal. per min. of rinse waters on a continuously flowing basis. Difficulties and costs involved in collecting and treating this quantity of waste directed detailed study to this phase of the operation. As a result, batch dumping of rinse waters is now practiced, and the total quantity of wastes containing cyanide has been reduced to 250 gallons per week. This has been accomplished at no sacrifice of product quality and results in the added economy of reduced purchases of city water used for that purpose.

Minimize Drag-Out

Since most rinse water contamination is a direct function of the amount of drag-out from plating or similar baths, extra efforts to minimize drag-out are warranted. Reductions may be accomplished by allowing suitable drainage prior to rinsing, the use of blasts of air to remove adhering liquid, or other appropriate practices will assist in this matter.

Many plants employ flowing rinse baths in which work is manually dipped at infrequent intervals. This practice results in mild contamination with cyanide of relatively large volumes of water, presenting a treatment problem out of proportion to the actual operation. Waste volumes of this type can be very materially reduced by the installation of a foot controlled valve which will permit rinse waters to enter the rinsing vat when work is being dipped, and stop the flow when the rinse is not actually in use. Foot controlled spray rinse operations can sometimes be applied, also for the purpose of reducing volumes of cyanide contaminated waste waters requiring treatment.

Chlorine Dosage

It will have been noted that all the plant examples outlined herein have used the principle of chlorine application for cyanide oxidation. In all cases the approximate dosage is in the ratio of 10 parts of chlorine for each part of cyanide in the wastes. The methods of chlorine application based on particular requirements of each problem have been shown. It is beyond the scope of this present paper to discuss or evaluate alternate methods for the actual treatment of cyanide.

The examples selected have been for purposes of illustrating a diversity of waste treatment problems at the several plants and methods which were used to accomplish satisfactory treatment of cyanide bearing wastes for ultimate disposal either separately or together with other types of general plant wastes. The need for detailed study of any industrial plant will be immediately apparent in the interest of maximum treating economies and the continuous production of a satisfactorily treated effluent.

Diligent Operators Needed

It is axiomatic that no industrial waste treatment plant can produce satisfactory results unless the operator of that plant is diligent, conscientious and has a recognition of the importance of his work. The training of an operator in his duties should be the responsibility of the designing engineer or other properly qualified persons. In the interest of safeguarding the capital expenditure and the continuous production of a satisfactorily treated effluent, plant management should carefully select the personnel to be charged with operating responsibility and assure that proper instruction is given. Needed maintenance should be applied to avoid outage of the treatment facilities and the possible necessity for shutting down plant operations at a later date for extensive repairs to the treating equipment which might otherwise be avoided.

Since state or other properly constituted authorities will have jurisdiction over the final discharge of treated effluent, proper operating log sheets should be maintained on which records of tests and other pertinent data are entered. Only through this procedure can a proper defense be built against unwarranted or false claims of downstream nuisances if the waste treatment plant is producing a satisfactory effluent.

N.Y. STATE PROPOSAL FOR FINANCING SEWAGE WORKS

One of the remaining problems in New York State's efforts to abate pollution is the fact that many municipalities do not have sufficient debt margin to construct the necessary remedial works.

To offset this problem, the Comptroller's Committee on Tax and Debt Limitations upon the recommendation of the Ostertag Committee, has proposed a constitutional amendment under which the cities can exempt from their debt limits up to 75 per cent of the cost of sewer systems and sewage treatment works, if through the use of sewer rentals or similar devices, they can be shown in the blueprint stage to be self-sustaining.

This amendment was approved by the 1950 legistature but must be ratified by the legislators in 1951 and by the electorate at the November 1951 elections. The need for this amendment is emphasized by the fact that at present 6 cities, 90 villages, and 13 towns can not build needed treatment works because of debt limitations.

CHLORINE CONTAINER HANDLING TRUCK

Adaptation of Light Utility Truck, Specially Rigged for Distributing One Ton Chlorine Containers to Up-Sewer Chlorinating Stations

by
FRANK H. MILLER
Chief Engineer
HAMPTON ROADS SAN. DISTRICT
NORFOLK, VA.

THE truck here pictured is a low bed, six wheel stake truck regularly used for system service work. It has been equipped for the handling of ton containers of chlorine transported from treatment plant container stock to up-sewer chlorinating stations. Advance arrangements for utilization of the equipment required no change at the Hampton Roads Sanitation District Commission's Boat Harbor Sewage Treatment Plant, where a stock pile of some 20 containers can be maintained and swing hoist equipment was available. At the three up-sewer pumping stations, where chlorine is applied, the truck can be backed into position for easy unloading. A fence has been constructed around the cylinder storage area for safety.

Adaptation of the truck for such chlorine container handling consisted of the following:

(1) A drum type winch was bolted to a steel bearing plate and mounted at the front end of truck bed. Winch handle was lengthened and a side steady-bearing provided at the right edge of truck bed.

(2) Runners of 2" x 6" boards were provided on each side of the bed

The Author

to give even spread bearing for the container, and built up stops were bolted in place in position giving best weight distribution on truck. Pin stops are provided behind the container to hold it in place—(see close-up view).

(3) Skids were constructed of 6" x 8" heart pine 12' long, the truck ends of which were supported and attached to truck bed by heavy (½" x 2½") strap iron hangers. These straps were carried about 2' along the bottom of the skids and bolted in place, bent up along the truck end of the runners and over to form hangers, which can be hooked into the bed tail channel. This channel was reinforced with ⅛" plates to assure adequate support.

(4) Dead men ties were bolted into bed tail channel for fastening two sides of spread sling.

(5) Wire rope (½") was constructed with spread V yoke to attach to truck bed with V being terminated in a single strand at about 8' from truck bed tail channel. This V sling assures stability at upper position of cylinder on skids and until cylinder is far enough down skids to assure steady bearing on both skids.

(6) For transportation of skids a rack was built up just behind the cab so that skid hangers could be inverted, hooked in place and suspended over cylinder during haul.

In operation the chlorine container is placed at bottom end of skids, with one or both ends on small block so that the loading sling can be pulled under the cylinder. Sling yoke is then attached to dead men. Then by turning winch cylinder is rolled up the skids and on to truck bed. On this flat surface it is readily rolled into position on bed by hand. Although two men usually work together, it is possible for one man alone to carry out the entire operation with no heavy lift or pull required.

Unloading is merely a reverse of this procedure, with the placing of

Light Utility Low-Bed Truck Equipped to Handle Ton Chlorine Containers

Safety loaded container on truck and close-up of loading winch and container in position.

Truck Loading or Unloading Sequence

A one man operation, with winch and loading cable of ½ in. wire rope.

cylinders largely controlled by positioning of truck.

Most of the equipment used was salvaged from odds and ends on hand. Fabrication was effected in the Commission's shop, with only about one man-day being required for the work. The original idea for this equipment was that of John D. Coenen.

40 Exhibitors for NEWWA Meeting at Poland Spring, Me.

As of the first of August, forty members of the Water and Sewage Works Manufacturers Assn., Inc., had reserved exhibit space for the *NEW ENGLAND WATER WORKS ASSOCIATION CONVENTION* scheduled for Poland Spring House, Poland Spring, Maine, September 17-20, 1950.

Included in the list were the following:

American City Magazine, The
Atlas Mineral Products Co.
Builders-Providence, Inc.
Calgon, Inc.
Central Foundry Co.
Centriline Corporation
Chicago Bridge & Iron Co.
Dean & Company, Payne
Dresser Manufacturing Div.
Eddy Valve Co.
Ford Meter Box Co.
Hersey Manufacturing Co.
Homelite Corp.
Hydraulic Development Corp.
Johns-Manville
Keasbey & Mattison Co.
Leadite Co.
Lock Joint Pipe Co.
Mueller Co.
Neptune Meter Co.
Pittsburgh-Des Moines Steel Co.
Pittsburgh Equitable Meter Div. Rockwell Mfg. Co.
Pollard Co., Joseph G.
Preload Corp.
Prescott & Sons, H. R.
Public Works Magazine
Red Hed Manufacturing Co.
Rensselaer Valve Co.
Smith Manufacturing Co., The A. P.
Smith Co., S. Morgan
United States Pipe and Foundry Co.
Walker Process Equipment, Inc.
Wallace & Tiernan Co., Inc.
Warren Pipe Co. of Mass., Inc.
Water & Sewage Works
Water Works Engineering
Wood Co., R. D.
Worthington-Gamon Meter Co.

A BELIEVE IT OR NOT!

Our records show your 4-1-50 water bill in the amount of $ 3.00, remains unpaid. We regret to advise it will be necessary for us to discontinue service unless the matter receives your immediate attention. We trust this will not be necessary.

GREENVILLE CITY WATER WORKS

Acct. No. 51400-B

J. L. Hawkins
1808 N. Main St.
City

And the Color of the Slip is Pink

There is nothing like evidence through exhibit. This is Exhibit "A" in the case of the Greenville S.C. Water Works vs. one John L. Hawkins of 1808 North Main St. Mr. Hawkins' water bill was overdue, and the above illustrated shut-off notice had been sent out, calling for immediate payment to prevent the well-known shut-off.

Evidently this fellow Hawkins isn't one of the Water Commission's preferred customers, because he is just a minimum water user. And, too, he's careless about paying up at times—must think he's a preferred customer. But, evidently the Water Works Office doesn't think so because he gets these notices to pay up or be shut off. We understand that he gets them frequently—at least that's what the young man who stuck this notice in his front door whispered to the writer who happened to be visiting the Hawkins' home at the time.

Who is this fellow Hawkins? Well, he's none other than John L. Hawkins, who resides in an attractive new ranch-type home on swank North Main St. And, believe it or not, he's just the Superintendent of this same Greenville Water Works. And, to the writer he confided that this outfit is hard-boiled, and no respector of persons, titles or rank. Then explained that he'd just been too busy on the outside laying new water-mains and getting new $1,000,000 bond issues passed by the council in the record time of 5 minutes to have time to think about paying a little water bill.

However, the opportunity was too "golden" to miss, so we pocketed the pink notice that the young man stuck in the Hawkins door, and here it is for the world to see. Yes—"It could happen in Greenville." Now we are wondering if the Mayor doesn't get a "pink slip" also at times.

Comments of the Editors

"C.O.D. vs O.C."

In our July issue we printed an article by M. B. Ettinger of the U.S. Public Health Service which discusses "Analytical Procedures for Industrial Wastes." With Mr. Ettinger's article we took liberties which are objected to by C. C. Ruchhoft, Chief of the Physics and Chemistry Section, U.S. Public Health Service Laboratories.

In editing Mr. Ettinger's paper we substituted "Chemical Oxygen Demand" and the abbreviation "C.O.D." where "Oxygen Consumed" and "O.C." were the terms used in the manuscript.

Mr. Ruchhoft takes exception to such editorial license on the grounds that the readers of Mr. Ettinger's paper may be led to believe that the terms "Chemical Oxygen Demand" and "C.O.D." has the stamp of approval of the U.S. Public Health Service, when such is not the case. It is felt by the Service that "Chemical Oxygen Demand" and "Biochemical Oxygen Demand" are too similar and therefore apt to mislead the naive into believing that the biological method and the chemical method of measuring the strength of sewages and wastes are merely two methods of measuring the same variables. On this score the U.S. Public Health Service wishes to avoid possible confusion by reserving the term "Oxygen Demand" for the designation of the *biological* demand only, and adhering to the old term "Oxygen Consumed" as designating the degree of oxidation observed in chemical oxidation.

Mr. Ruchhoft points out that the recently proposed methods for determination of "Chemical Oxygen Demand" are but modifications of the old "Oxygen Consumed" procedure that we have been dealing with for many years past. He reprimands us for making the changes in "Oxygen Consumed" to "Chemical Oxygen Demand" instead of conforming to the currently standard nomenclature of "B.O.D." and "O.C." as used in *Standard Methods of Water and Sewage Analysis.*

We accept the reprimand on the score that the changes were made in a paper originating in the U.S. Public Health Service without review with the author. As to the substitution of the term "Chemical Oxygen Demand" for "Oxygen Consumed" it is our opinion that "C.O.D." is the more correct and the more indicative term.

For a number of reasons it is our hope, and also the expressed hope of others. that a simple, dependable and rapid chemical test, which will give oxygen demand (C.O.D.) values that can be converted through the use of a proper factor to bio-chemical oxygen demand (B.O.D.) values, will become a reality. Recognizing the worth of such a test, it is the present intention of the Standard Methods Committee to include in the forthcoming edition of *Standard Methods of Water and Sewage Analysis* the most likely procedures for the determination of Chemical Oxygen Demand. The term (C.O.D.) will apply in connection with the newer methods for determining oxygen demand chemically, whereas the old permanganate method for determining "Oxygen Consumed" (O.C.) will be so designated and retained because of its venerability, and any value which it may have in future applications.

Since Mr. Ettinger's paper made reference to the several newer tests for chemical oxidation now undergoing evaluation by the Standard Methods Committee, we presumed that we were clarifying the author's statements by substituting the newer and more descriptive term "Chemical Oxygen Demand" for the term "Oxygen Consumed".

Although we concede the fact that the U.S. Public Health Service has the prerogative of adhering to the term "Oxygen Consumed" to designate oxygen demand, determined chemically by whatever method, and "Oxygen Demand" as indicative of the biological demand only, we look forward to the establishment of "Chemical Oxygen Demand" as a *Standard Method,* designed to reveal qualities of sewages, trade wastes and effluents which have heretofore not been revealed by any of the established tests in *Standard Methods of Sewage Analysis.*

If the newer methods for "Chemical Oxygen Demand" can not be substituted in whole for the "Biochemical Oxygen Demand" test, it is our belief and that of many others, that the improved chemical tests will greatly supplement the old "O.C." and the "B.O.D." test which is influenced by many and oftentimes perplexing, variables.

Patent Terminology— Some Corrections

In our August issue we printed an article by Paul S. Bolger under the title *"Invention an Evolutionary Process."* The author, as an attorney who practices before the U.S. Patent Office and Patent Courts, has called to our attention certain statements in the article which may mean but little to the lay reader, but are actually erroneous. In an attempt to protect Mr. Bolger in the eyes of other patent attorneys who may have read his article, we hasten to state that the errors called to our attention came about as the result of editorial ignorance concerning patent terminology.

The most serious misstatement, as far as our readers are concerned, is found in the subheading (of our own writing) which states "Validity of Patents Determined Only in the Courts." As indicated in the text, Mr. Bolger states that the proper subheading would have been "Patent Validity Subject to Court Review," since a patent must be considered valid unless, and until, proven otherwise in the courts. This is an important distinction.

A second objection is made to the use of the term "specific *claims*" in referring to the all important *claims* in a patent which define the areas of *exclusive* grant. According to Mr. Bolger, in patent terminology *"specific* claims" has a well defined meaning, but is out of place in the sentence in which it appears. The proper term in this instance would have been *"actual* claims."

Still another objectionable clause is that which states that a patent will be granted on that limited area of improvement, or on "a combination of prior improvements, yielding a *novel* further improvement." This clause should read "a combination of prior improvements yielding an *unexpected* and *novel* result which effects a *further* improvement."

We humbly accept Mr. Bolger's criticism, and now realize that it is dangerous to take liberties with the contribution of a Patent Attorney discussing the fine points (and we mean fine points) of the patentability of invention. We can only say that we hope these corrections will clear him with his fellow attorneys and the U.S. Patent Office.

L. H. Enslow

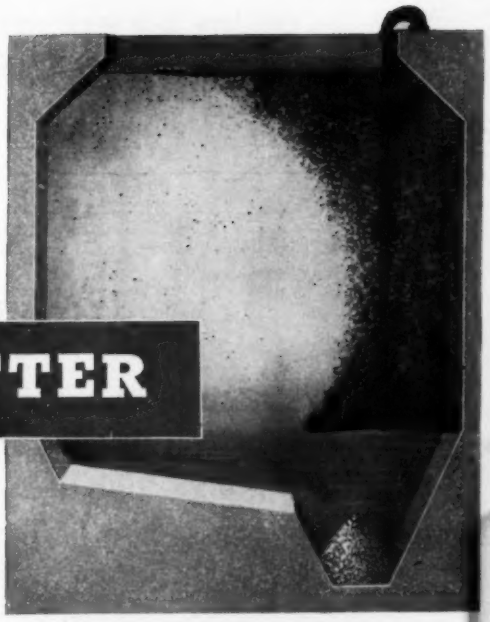
MAXIMUM REMOVAL

CLEAN GRIT

NO MECHANISMS

Chicago

AER-DEGRITTER



AIR CONTROLLED VELOCITIES

INDEPENDENT OF FLOW

LOW COST

SIMPLE STRUCTURE

F.S.W.A. Convention

Washington, D. C.

Hotel Statler, Oct. 9-12

Booths 65-72

The 'Chicago' Aer-Degritter now provides the only method of removing grit and sand from sewage without movable mechanical equipment. Air introduced through 'Chicago' Swing Diffusers and Precision Diffuser Tubes controls the velocity of the flow. All sand of 0.2 mm. (65 mesh) and larger is washed and deposited in a hopper at the bottom of the tank.

Analysis of grit removed by this system shows less than 10% volatile matter and only a negligible trace of putrescible organics. Because coarse sewage material will not interfere with the operation of the Aer-Degritter and because it does not affect the hydraulic design of the plant, Aer-Degritters may be installed ahead of all mechanical equipment.

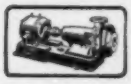
'Chicago' Aer-Degritters have been operating successfully at Oildale, California; Columbus, Ohio; Tomah, Wisconsin; and Bellaire, Texas. Additional Aer-Degritters are being installed in Sedalia, Missouri; Ann Arbor, Michigan; Jasper, Indiana; and Fort St. John, B. C., Canada.

CHICAGO PUMP COMPANY

SEWAGE EQUIPMENT DIVISION

2300 WOLFRAM STREET — **CHICAGO 18, ILLINOIS**

Flush Kleen, Scru-Peller, Plunger, Horizontal and Vertical Non-Clogs Water Seal Pumping Units, Samplers.



Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.

BOND-O Homogenized

Uniformity brings you the perfect jointing compound

Every ounce, every pound, every bag of Bond-O is identical in structure. Every cast iron pipe joint made with Bond-O—if made the same way—will perform in the same way. In short—if made with reasonable care—every Bond-O joint will be a perfect joint.

To the Water Works Engineer, the use of machine blended Bond-O means uniformity in strength—in tightness—in bonding—in initial seepage—in sealing. It means economy through the elimination of faulty joints . . . economy in man hours—and in money. It means that once a BOND-O joint is made, not another cent need be spent on it for maintenance. Proof of this is the fact that there has never been a single reported failure of a BOND-O joint!

BOND-O

NORTHROP & COMPANY, INC.
SPRING VALLEY, NEW YORK

MEETINGS SCHEDULED:

SEPT. 6-8—ST. PAUL, MINN. (St. Paul Hotel)
Minnesota Section A.W.W.A. Sec'y, L. N. Thompson, Gen. Mgr., Water Dept., St. Paul, Minn.

SEPT. 7-8—UPPER SARANAC LAKE, N. Y. (Saranac Inn)
New York Section A.W.W.A. (Fall Meeting) Sec'y, R. K. Blanchard, 50 West 50th Street, New York, N. Y.

SEPT. 11-13—LAKE OF BAYS, ONTARIO (Bigwin Inn)
Canadian Institute of Sewage and Sanitation. Secretary, Dr. A. E. Berry, Parliament Building, Toronto, Ont.

SEPT. 13-14—HUNTINGTON, W. VA. (Hotel Pritchard)
W. Virginia Section A.W.W.A. Sec'y, H. K. Gidley, Dir. Div. of San. Eng., State Health Dept., Charleston 5, W. Va.

SEPT. 14-15—HUNTINGTON, W. VA. (Hotel Pritchard)
West Virginia Sewage and Industrial Wastes Assn. Sec'y, R. G. McCall, Room 643, State Capitol Bldg., Charleston, W. Va.

SEPT. 18-21—POLAND SPRING, ME. (Poland Spring House)
New England Water Works Association. (Annual Convention) Sec'y, Joseph C. Knox, 1204 Tremont Bldg., Boston, Mass.

SEPT. 19-21—OSHKOSH, WIS. (Raulf Hotel)
Wisconsin Section A.W.W.A. Sec'y, L. A. Smith, Supt. Water Dept., Madison, Wis.

SEPT. 19-21—DAVENPORT, IOWA (Hotel Blackhawk)
Iowa Sewage Works Association. Sec'y, Leo Holtkamp, E. Ohio Street, Webster City, Iowa.

SEPT. 20-22—ATLANTA, GA. (Georgia Institute Technology)
Georgia Water and Sewage School. Sec'y, Van P. Enloe, R.F.D. No. 5, Box 363, Atlanta, Ga.

SEPT. 24-26—CALGARY, ALBERTA (Palliser Hotel)
Western Canada Water and Sewage Conference. Sec'y, H. C. Lindsten, 301 Hamilton Bldg., Winnipeg, Manitoba.

SEPT. 26-29—ATLANTA CITY, N. J. (Claridge Hotel)
Pennsylvania Water Works Association. Sec'y-Treas., C. M. Hartman, 510 Telegraph Bldg., Harrisburg, Pa.

SEPT. 27-29—SANTA FE, N. M. (LaFonda Hotel)
Rocky Mountain Sewage Works Association. Sec'y, C. H. Coberly, Room 329, 1441 Welton St., Denver, Colo.
Rocky Mountain Section A.W.W.A. Sec'y, Geo. J. Turre, Room 120, City-County Bldg., Denver, Colo.

SEPT. 28-29—COLUMBUS, OHIO (Neil House)
Ohio Section A.W.W.A. Sec'y, F. P. Fischer, 812 Perry-Payne Bldg., Cleveland, Ohio.

SEPT. 28-29—ABERDEEN, S. D. (Hotel Alonzo)
South Dakota Water & Sewage Works Conference. Charles E. Carl, Div. of Sanitary Engineering, Pierre, S. D.

OCT. 1-3—ST. LOUIS, MO. (Sheraton Hotel)
Missouri Section A.W.W.A.
Missouri Water & Sewage Conference. Sec'y, Warren Kramer, State Office Bldg., Jefferson City, Mo.

OCT. 4-6—BISMARCK, N. DAKOTA (Hotel Patterson)
North Dakota Water & Sewage Works Conference. Chairman, Edward J. Booth, City Engr., Bismarck, N. D.

OCT. 9-12—WASHINGTON, D.C. (Statler Hotel)
Federation of Sewage Works Associations. Exec.-Sec'y, W. H. Wisely, 325 Illinois Bldg., Champaign, Ill.

OCT. 11—WATERVILLE, ME.
Maine Water Utilities Assn. (Marks the 25th Anniversary of founding of the Assn.) Sec'y, Earle A. Tarr, Supt. Water District, Winthrop, Me.

MEETINGS SCHEDULED:

OCT. 11-13—MOBILE, ALA. (Battle House Hotel)
Alabama-Mississippi Section A.W.W.A. Sec'y, J. L. Snow, 601 First National Bank Bldg., Montgomery, Ala.

OCT. 15-18—NEW YORK CITY, N.Y. (Hotel New Yorker)
American Public Works Association Congress. Exec. Director, Donald Herrick, 1313 East 60th St., Chicago 37, Ill.

OCT. 15-18—NEW ORLEANS, LA. (Roosevelt Hotel)
Southwest Section A.W.W.A. Sec'y, Leslie A. Jackson, Robinson Memorial Auditorium, Little Rock, Ark.

OCT. 16-18—PITTSBURGH, PA. (Hotel Wm. Penn)
Engineers' Society of Western Pa. Chairman, W. J. Murdoch, Hotel Wm. Penn, Pittsburgh, Pa.

OCT. 18-20—PITTSBURGH, PA. (Roosevelt Hotel)
Pennsylvania Section A.W.W.A. Sec'y, L. S. Morgan, 415 First National Bank Bldg., Greensburg, Pa.

OCT. 23-25—CHARLESTON, S.C. (Hotel Fort Sumter)
Southeastern Section A.W.W.A. Sec'y, T. A. Kolb, 433 Wade Hampton Bldg., Columbia, S. C.

OCT. 23-25—MEMPHIS, TENN. (Hotel Peabody)
Kentucky-Tennessee Section A.W.W.A. Kentucky-Tennessee Industrial Wastes & Sewage Works Assn. Sec'y, R. P. Farrell, 420 Sixth Ave., N., Nashville, Tenn.

OCT. 24-27—SAN DIEGO, CALIF. (U.S. Grant Hotel)
California Section A.W.W.A. (Annual Meeting) Sec'y, Wm. W. Aultman, Box 38, LaVerne, Calif.

OCT. 25-26—SPRINGFIELD, ILL.
Illinois Water Works Operators Association. Sec'y, John Briggs, Ass't., Freeport, Ill.

OCT. 25-27—DETROIT, MICH. (Detroit Leland Hotel)
Michigan Section A.W.W.A. Sec'y, T. L. Vander Velde, 2609 E. Saginaw St., Lansing 12, Mich.

OCT. 26-27—DES MOINES, IOWA (Fort Des Moines)
Iowa Section A.W.W.A. Sec'y, H. V. Pedersen, Supt., Water Works, Municipal Bldg., Marshalltown, Iowa.

OCT. 26-28—ATLANTIC CITY, N.J. (Hotel Madison)
New Jersey Section A.W.W.A. Sec'y, C. B. Tygert, P. O. Box 178, Newark, N. J.

OCT. 30-NOV. 3—ST. LOUIS, MO. (Hotel Statler)
American Public Health Association. Exec.-Sec'y, Dr. Reginald M. Atwater, American Public Health Ass'n., 1790 Broadway, New York, N. Y.

NOV. 1-3—WILMINGTON, DEL. (DuPont Hotel)
Chesapeake Section A.W.W.A. Sec'y, C. J. Lauter, 5902 Dalecarlia Place, Washington 16, D. C.

NOV. 6-7—RICHMOND, VA. (Jefferson Hotel)
Virginia Section A.W.W.A. Sec'y, W. H. Shewbridge, 713 State Office Bldg., Richmond, Pa.

NOV. 13-15—DURHAM, N.C. (Washington Duke Hotel)
North Carolina Section A.W.W.A. and North Carolina Sewage Works Association. Sec'y, E. C. Hubbard, State Board of Health, Raleigh, N. C.

NOV. 12-15—FT. LAUDERDALE, FLA. (Governor's Club Hotel)
Florida Section A.W.W.A. Sec'y, Marvin R. Boyce, 504 Pennsylvania, Clearwater, Fla. (Joint Session with) **Cuban Section A.W.W.A.** Sec'y, L. H. Daniel, Baratillog 9, Havana, Cuba (and) **Florida Sewage Works Association.** Sec'y, Perry Teeple, P. O. Box 210, Jacksonville, Fla.

NOV. 16—BOSTON, MASS. (Hotel Statler)
New England Water Works Assn. Sec'y, Jos. C. Knox, 204 Tremont Bldg., Boston, Mass.

NOV. 30-DEC. 2—TUCSON, ARIZ. (Hotel Pioneer)
Arizona Section, A.W.W.A.
Arizona Sewage & Water Works Association. Sec'y, Helen Rotthaus, San Eng. Div., State Capitol, Phoenix, Ariz.

DEC. 13—BREWER, ME.
Maine Water Utilities Association. Sec'y, Earle A. Tarr, Supt., Winthrop, Me.

DEC. 21—BOSTON, MASS. (Hotel Statler)
New England Water Works Assn. Sec'y, Jos. C. Knox, 204 Tremont Bldg., Boston, Mass.

IF . . .

PUMPING INDUSTRIAL WASTES

IS YOUR HEADACHE—

SEND FOR THESE BULLETINS!

Bull. #419
"Sumps for 'VS' Pumps"

Bull. #400
"Pumping Solids"

(Shows Penna. approved construction)

THE MOST VERSATILE LINE OF HORIZONTAL & VERTICAL PUMPS AVAILABLE . . . .

BARRETT, HAENTJENS & CO.
HAZLETON, PA.
Pittsburgh, Penna. — Birmingham, Ala.
Huntington, W. Va. — Phoenix, Arizona

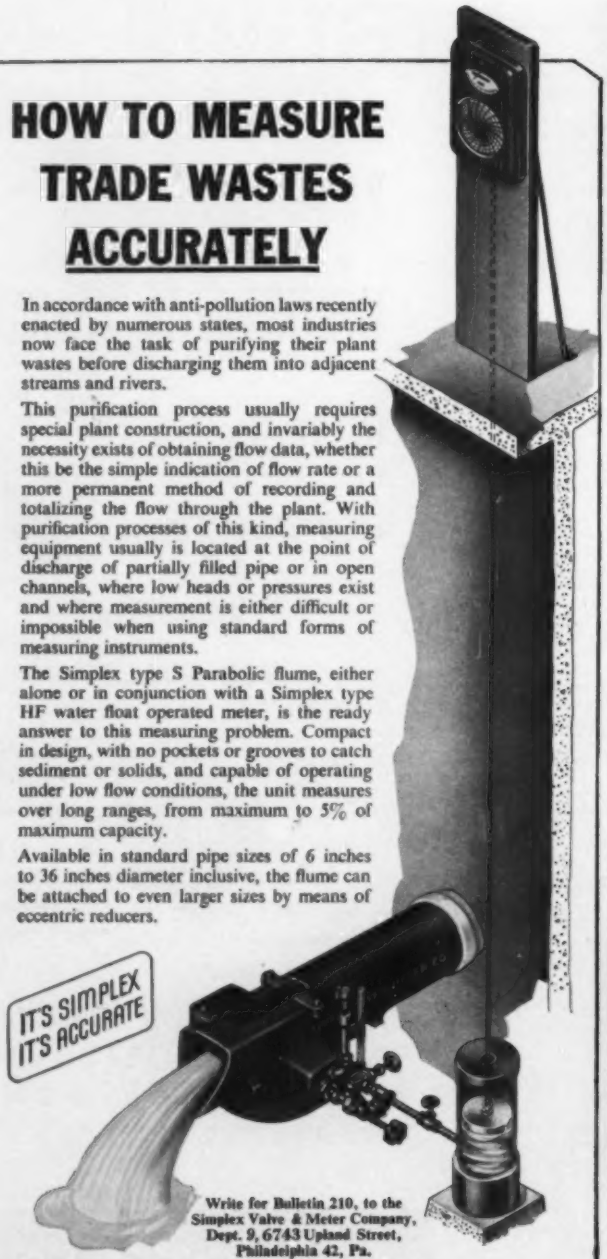
HOW TO MEASURE TRADE WASTES ACCURATELY

In accordance with anti-pollution laws recently enacted by numerous states, most industries now face the task of purifying their plant wastes before discharging them into adjacent streams and rivers.

This purification process usually requires special plant construction, and invariably the necessity exists of obtaining flow data, whether this be the simple indication of flow rate or a more permanent method of recording and totalizing the flow through the plant. With purification processes of this kind, measuring equipment usually is located at the point of discharge of partially filled pipe or in open channels, where low heads or pressures exist and where measurement is either difficult or impossible when using standard forms of measuring instruments.

The Simplex type S Parabolic flume, either alone or in conjunction with a Simplex type HF water float operated meter, is the ready answer to this measuring problem. Compact in design, with no pockets or grooves to catch sediment or solids, and capable of operating under low flow conditions, the unit measures over long ranges, from maximum to 5% of maximum capacity.

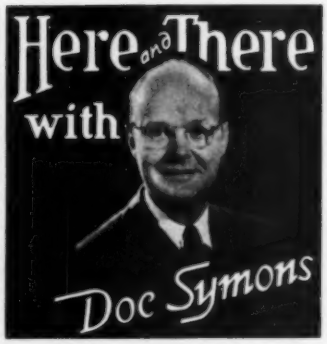
Available in standard pipe sizes of 6 inches to 36 inches diameter inclusive, the flume can be attached to even larger sizes by means of eccentric reducers.



Write for Bulletin 210, to the Simplex Valve & Meter Company, Dept. 9, 6743 Upland Street, Philadelphia 42, Pa.

SIMPLEX

VALVE AND METER COMPANY



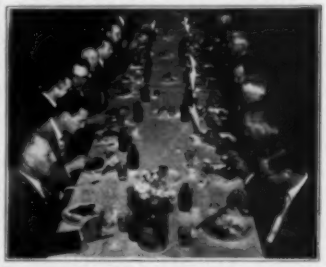
H.T.M.A.—And with September here, it's time to look over the fall schedule of conventions. I see a number that I'm definitely going to attend and a number of others I'd like to look in on, but can't. If I get out, or up, or over, or down your way, be sure to have a story for me.

* * *

Sam (Elizabeth, N.J., Water Supt.) Newkirk, one of my more regular correspondents, sends me a story about a Champ.—Harry Hill, Meter Reader of Willoughy, Ohio, reached the age of fifty recently and celebrated by walking his 75,000th mile and reading his 1,000,000th water meter. He's never missed a day in 31 years of reading meters.—Can any one tie that record?

* * *

My thanks also to J. C. Smith, and E. A. Schmidt and their Engr. Corp. photographer for the pictures of the famous oyster roast held at the Dalecarlia Filter Plant during the Chesapeake Section meeting last



November. On the left in positions 5, 6, and 7 are "Bob" (Mathieson) Quinn of Baltimore; George (USGS) of Washington, and Fred (Infilco) Eidsness of Philadelphia. It is obvious that these latter two are listening to Dr. A. P. Black, then AWWA Prexy, who is directly across the table from them. Please note: the second man from the front on the right is Charlie (Controversial

(*Continued on page* 104A)

TYLOX RUBBER GASKETS MAKE SAN ANTONIO'S 72" OUTFALL SEWER

Leakproof for Life!

Thumb-nail Facts about San Antonio's New Outfall Sewer

The line consisted mainly of 72", 60", and 54" reinforced concrete tongue and groove pipe, in 12' lengths.

Almost 50,000,000 pounds of reinforced concrete held together with 2200 Tylox gaskets.

Total length of the line approximately five miles.

No leaks on the project even though parts of the line had as high as 40' of head where it crossed under the San Antonio River.

The line was laid by Reising Construction Co. Consulting Engineer, Mr. H. R. F. Helland. City Engineer, Mr. W. W. Toxey.

YOU could bail out all the infiltrated water with a teaspoon, so tight are the joints in San Antonio's new five mile long outfall sewer. What's more, the joints will remain leakproof for the life of the line. *San Antonio's sewage disposal plant will treat sewage, not infiltration.*

Sewer lines laid with Tylox rubber joints are permanently tight. Rubber-coupled pipe, laid in this country more than 60 years ago, is still going strong. Tylox Joints are economical, too. Lower "per laid foot" cost, lower maintenance cost.

MAKING JOINTS WITH TYLOX RUBBER GASKETS IS AS SIMPLE AS A B C

Cement tongue and snap on Tylox gasket. Lubricate sliding surfaces with Tylox Cement. Shove the pipe home.

Write, wire, or phone for Specification Data and Literature on Tylox Gaskets.

HAMILTON KENT MANUFACTURING CO.

KENT, OHIO

218 GOUGLER AVE. TEL. 3449

"THE ONLY PERMANENTLY TIGHT LINES ARE LAID WITH RUBBER JOINTS"

Guaranteed to save
TIME, WORK AND CASH

"The tougher the job, the tougher the tools have gotta be—for me that's RIDGIDs."

RIDGID's guarantee means no pipe wrench housing expense—at all, ever

● Workers everywhere like the work-saver features that make RIDGID the world's favorite. Housing is guaranteed against breakage or distortion. Adjusting nut spins easily in all sizes 6" to 60." Handy pipe scale on hookjaw. Instant-action non-slip, non-lock jaws. Powerful comfort-grip I-beam handle with flared end that won't let your hand slip off. RIDGIDs save your time and money. Buy them at your Supply House.

RIDGID
WORK-SAVER PIPE TOOLS
THE RIDGE TOOL CO. • ELYRIA, OHIO

(*Continued from page* 102A)

Bridge Expert) of De Laval in Trenton. Any one care to identify the others for me besides Kim Hicks (right front) of Philadelphia. Messrs. Schmidt and Smith also provided this picture of the cooks for that oyster roast.

The fellow in front is James A. (Pop) Crandall, Asst. Head Operator, Dalecarlia Pumping Station and "Chef, Extraordinary."

* * *

My bosom pal, Don E. Bloodgood, Prof. of San. Engineering at Purdue University, edits and publishes a very interesting news letter called *Sanitary Engineering News*. In the June issue he called attention to an article in *American City* entitled "A Garden Grinder in Every Home." This prompted a letter from "Bill" Foster, Engineering Editor of that august magazine. Somehow a copy came to my desk, and I think I know why. Anyway here's the letter—"Prof. Don. E. Bloodgood: Dear Prof.:—Needless to say we are all impressed with your editorial accomplishment in your June issue of running an account on the 'Garden Grinder in Every Home.' We have in the past very nearly been able to publish accounts of Traffic Grinders; and we have been able to use 'Ground Water' so that it has produced enough confusion to command editorial respect. I suggest a doctor's thesis analyzing whether water passing through a kitchen grinder is Ground Water.

"Lest, however, you feel that our magazine is not also able to produce those journalistic triumphs, I respectfully call your attention to our May issue, page 132, in which we successfully operate an aeration channel on its side. I dare say that such a thought has never even occurred to you in your otherwise exhaustive and thorough studies of the sanitary engineering profession.

(*Continued on page* 106A)

NOW—Simpler, Faster, Automatic Titrations!

Here's another new Beckman advancement in instrumentation—*an instrument that runs your titrations for you.* It's the Beckman Automatic Titrator—the instrument that makes accurate titrations more rapidly and conveniently than by manual methods.

SIMPLE OPERATION: In a series of titrations, simply fill the burette, place the sample in the beaker—and the Beckman Automatic Titrator takes over from there. Raising the beaker holder into position automatically starts the stirrer motor and begins delivering titrating solution into the sample.

A special circuit electrically anticipates the approaching end point, scaling down delivery of the titrating solution in progressively smaller increments to assure a highly accurate titration. When the end point is reached, delivery of the titrating solution stops and a light shows completion of the titration—*all automatically and without attention from the operator.*

Whether your laboratory is large or small the Beckman Automatic Titrator provides important advantages in your titrating operations...

- *It releases the technician during titration, enabling him to perform other operations such as preparing samples, or calculating results.*
- *It eliminates the fatigue caused by close observation required in manual procedures.*
- *It gives objective, reproducible results... eliminates errors due to personal factors.*
- *It provides time-saving conveniences for sample handling.*

PERFORMS A WIDE VARIETY OF TITRATIONS—Neutralization, Oxidation-Reduction, Precipitation, Complex-Formation and other types.

NO SPECIAL TRAINING IS REQUIRED—rapid and accurate titrations can readily be performed without special skill or technique.

QUICK, SIMPLE OPERATION—completes many routine titrations in only 1-1½ minutes—even titrations to 0.1% accuracy in 2½ minutes or less. Change of sample is simple, rapid—a single motion raises, locates and secures new sample in operating position.

CONVENIENT, VERSATILE, ADAPTABLE—0° to 100° C temperature compensation . . . adjustable holder accommodates 10 ml to 400 ml beakers or similar vessels . . . instrument may be used with all standard burettes down to 5 ml . . . as many as four delivery units accommodated by single amplifier control unit . . . . uses standard Beckman electrodes . . . electrode holders and delivery tip can be pivoted into any required position . . . ample provision for mounting heating devices or other special equipment.

ALSO A RELIABLE pH METER—the Beckman Automatic Titrator can also be used as an AC-powered pH meter to give accurate readings over the range 0 to 14 pH, as well as millivolt readings from −600 to +1400 mv.

For full details on this new Beckman instrument see your authorized Beckman dealer—or write direct. *Beckman Instruments, National Technical Laboratories, South Pasadena 20, California.*

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BECKMAN INSTRUMENTS
control modern industries

Beckman Instruments include: pH Meters and Electrodes — Spectrophotometers — Radioactivity Meters — Special Instruments

(*Continued from page* 104A)

"But to pay proper tribute to others who have scaled similar editorial pinnacles against odds, we should doff our hats to Ed Cleary, who, when guiding the destinies of *Engineering News-Record*, successfully elected W. W. *Homer* (Horner) president of the Amer. Soc. of Civ. Engrs. in an appropriate issue of that magazine. For this great accomplishment he has been made Chief River Watcher on the Banks of the Ohio.

"More recently, we were impressed and awed by the operations of that great scientist, Dr. George E. Symons, who successfully and thoroughly loused up a picture and caption involving the aforementioned reformed reporter (Cleary), now sulking in Cincinnati and saying nasty things about the courts of West Virginia. For this neat job of switching pictures, Doc Symons was awarded the title of Managing Editor and Waste Basket Filler.

"It is a real and heart-warming pleasure to count you among the select circle of accomplished technical reporters. At a fitting time we will consider you an applicant for the Ancient Order of the Unused Typewriter Erasers. Sincerely yours, 'Bill.'"

* * *

Picture of a man looking for a drink of water at the Philadelphia Convention. None other than that peerless, that incomparable, that none whicher, Milt Rosen, Commr. of Public Utilities from St. Paul, who was curious as to what was really in the Old Oaken Bucket at the famous WSWMA well. P.S.—He didn't find what he was looking for.

Out Illinois way, George B. Pringle, Supt. of Water, Highland Park Ill., is the official punster of the Illinois Section. No meeting of that section is complete without the white haired Mr. Pringle rising to assail the ears of the audience with a pun. Quite often they are really funny. Occasionally he comes up with a good idea as well. Take the time for instance, recently when he proposed the formation of a "Society for the Prevention of Writing Unnecessary Papers."—"Nuff" Said!

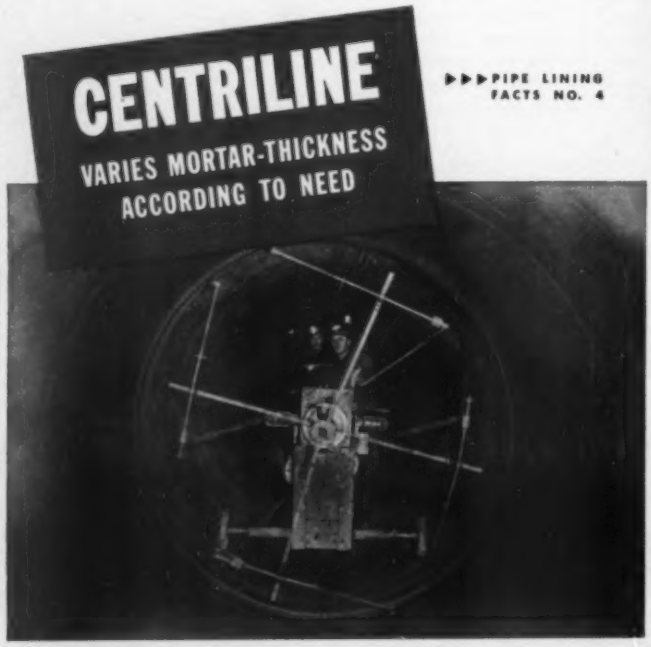
* * *

Small World No. 12—When I went to Buffalo, N.Y., some 14 years ago, to establish a laboratory for the Buffalo Sewer Authority, the best available space was in the Customs House on Bird Island and I named the lab the Bird Island Laboratory. I soon learned that the island(?), a piece of land between the Niagara River and the Erie Canal was not named for the numerous sea gulls that inhabited it. It, and Bird Ave. were named for the Bird family. And much to my surprise a couple of years ago, I was talking to Cy (Pitometer) Bird of Chicago and discovered that "the" Bird was his grandfather.—Small World.

* * *

When "Bill" (Builders-Providence) Rogers went to Denver in May, he had hardly walked a block when he was stopped and asked for his shaving permit. Then and there he had to buy one. The Official Shavers Permit had to be carried by

(*Continued on page* 108A)



The Centriline process is extremely flexible in providing linings of variable thickness in accordance with the degree of protection necessary. The thickness of the lining is controlled in inverse proportion to the forward speed of the Centrifugal machine. Thus, when cleaning reveals sections of a main particularly affected by electrolysis or corrosion and strengthening is desirable, an increase in thickness is obtained by slowing the speed of the machine.

No matter what plate thickness or plate conditions are encountered—serious deterioration and penetration included—the flexibility of the Centriline Process restores capacity to better than new and vastly increases the life expectancy of the pipeline.

▶▶▶▶ WRITE TODAY FOR THE 28 PAGE CENTRILINE CATALOG

REG. U. S. PAT. OFF.

CENTRILINE CORPORATION
A subsidiary of Raymond Concrete Pile Co.
140 CEDAR STREET • NEW YORK 6, N.Y.
Branch Offices in all Principal Cities in the United States and Latin America.

CEMENT MORTAR LININGS FOR WATER MAINS
Centrifugally Applied in Strict Conformity with A. W. W. A. Specifications

THE FIRST MECHANICAL JOINT TAPPING SLEEVE AND VALVE

ELIMINATES { MELTING / POURING / CAULKING

A new all Mechanical Joint Tapping Sleeve and Valve, installed quickly and easily even by untrained workmen. The only installation equipment necessary is a 10" ratchet wrench and a standard open end wrench.

There are no joints to pour or caulk.

Installation can be made in wet trenches in any kind of weather.

The "Stuffing Box" type joints require no cutting or scarfing of rubber gaskets on job.

Assemble Sleeve on main—attach the Valve, the installation is complete, ready for tapping and the joints are permanently bottle-tight.

32

GATE VALVES
CHECK VALVES
FIRE HYDRANTS
INSERTING VALVES
TAPPING SLEEVES AND VALVES
WATER SERVICE BRASS GOODS

THE A. P. SMITH MFG. CO.
ESTABLISHED 1896
EAST ORANGE, NEW JERSEY

FLOOR STANDS
INDICATOR POSTS
TAPPING MACHINES
INSERTING MACHINES
PIPE CUTTING MACHINES
CORPORATION TAPPING MACHINES

(*Continued from page* 106A)

all clean shaven men during the celebration of the Denver Centennial until July 4th. These permits were sold by all Centennial Assn. Officials, Barbers, Sheriffs, and Brothers of the Brush. "Bill's" number was 19,303.

* * *

You have often heard me call attention to C. (ubic) C. (entimeter) Larson of Springfield, Ill.—Well, did you ever notice that Paul Merkel, Cons. Chem., Reading, Pa., has the initials P.P.M.—old parts per million himself.

Hazards of Convention Attending —At the Canadian Section AWWA meeting in Niagara Falls, Ont., meeting in April, E. A. (Siggie) Sigworth, the Nuchar man, gave his bag to a bell hop, checked out and went downstairs to the hotel entrance just in time to see his bag put in an automobile, which promptly drove off while "Sig" frantically noted its license and the fact that it was from Toronto.

* * *

That'll be all for a spell and I'll be seeing you around the country.

V.T.Y.—Doc.

M & H VALVE
AND FITTINGS COMPANY
ANNISTON, ALABAMA

The wide use of Standardized Mechanical Joint Cast Iron Pipe for water supply systems has created an urgent demand for Mechanical Joint Valves, Hydrants and Accessories. M & H has been a leader in recognizing this important trend and can supply AWWA Gate Valves with Mechanical Joint ends, in sizes 2" to 30" inclusive . . . Mechanical Joint Cutting-In Sleeves . . . and Mechanical Joint Hydrants in all sizes and all types.

M & H Mechanical Joint features are: Ease and speed of installation, construction economy, joint deflection, leak-tight, long life. Used with AWWA, Classes A, B, C, D; Federal Specification WW-P-421; or Classes 100, 150, 200, 250 Centrifugal Pipe.

Fig. No. 67M

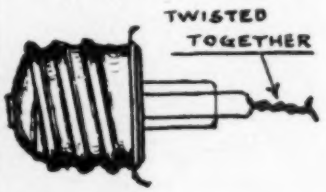
WRITE FOR CIRCULAR No. 49

Our New Circular No. 49 shows important installation dimensions of M & H AWWA Mechanical Joint Hydrants and Valves . . . Underwriters and Associated Factory Mutual approved Post Indicator Valves . . . and Cutting-In Sleeves.

M & H Products · Everywhere

How to Make an Emergency Fuse*

Here is a handy trick that is a "good one to know" on the occasion of the blowing out of a fuse, and when no other fuse was available: Take the remainder of an ordinary burned out electric lamp bulb, such as we usually throw into the ash



can, break the glass away, and simply twist together the remaining wires, as indicated in the sketch. Those wires, too, will "burn out", of course, just like a regular fuse, when the amperage is greater than it should be.

It may be that many readers would be opposed to using this kind of fuse. But it has been the writer's experience that most executives are inclined to "take chances" when certain emergencies exist. This writer has used substitutes for fuses and probably every reader has perpetrated something similar. But be sure to replace this emergency fuse —or any other emergency fuse—as soon as a regulation fuse can be obtained.

Better still, always keep an ample supply of fuses on hand so that an emergency such as the above will never take place.

Clean Stream In Georgia

The Sanitary Engineering Division of the Georgia Dept. of Public Health has published a very attractive book as a part of its public relations program for abatement of pollution in that state. This book, which is profusely illustrated with actual plants in Georgia, is "presented to illustrate the progress

*Contributed by W. F. Schaphorst, M.E., Newark, N.J.

made by Georgia communities in protecting streams against domestic and industrial pollution."

According to W. H. Weir, G. R. Frith, and N. M. deJarnette of the Division of Water Pollution Control, "the publication will be of direct service to officials of municipalities and industries concerned with providing adequate sewage and industrial waste treatment. Citizens and civic groups will find in it useful information on a subject of rapidly increasing public health interest."

The book defines stream pollution, explains how it can be prevented, tells how to go about informing citizenry of the need for sewage treatment, explains the importance of a good consulting engineer, and discusses source of financing, rates and rate laws.

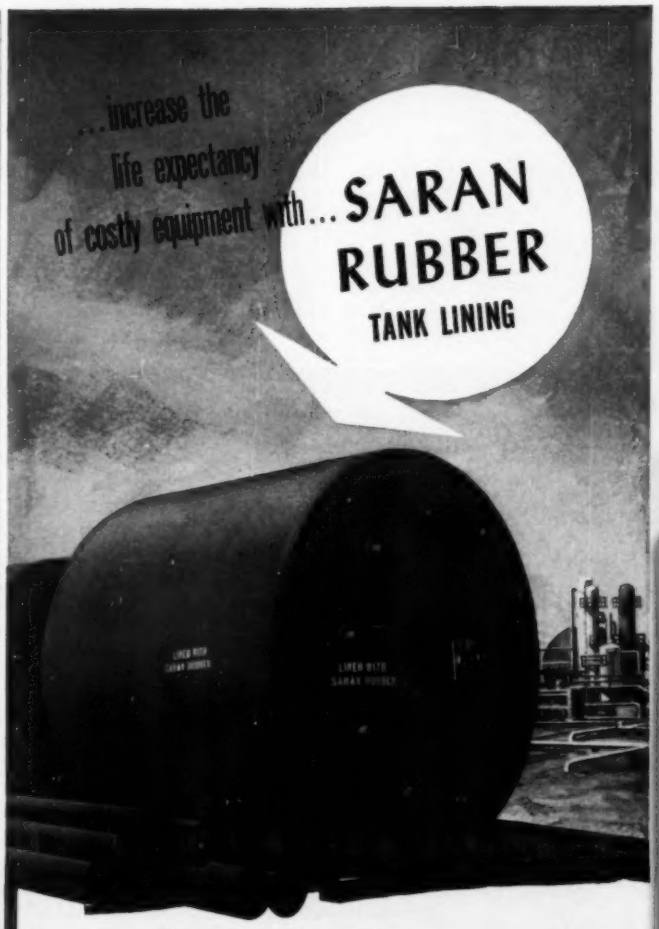
This is an excellent example of a good public relations approach. It is a book that persons in other states will find helpful. A limited number of copies are available. Write to W. H. Weir, State Sanitary Engineer, Water Pollution Control Div., Atlanta 3, Ga.

Something New: Want to Buy Some HOT WATER?

Not long ago this writer was in Brookings, S. Dak., where he learned about an interesting "new business" —selling hot, soft water, to housewives—and delivering same by truck ready for immediate use.

The business was started by two young veterans. They had just started a trucking business and the idea jelled as a means of keeping their trucks busy.

Where do they get the hot water? From the municipally owned light and power plant. They haul the water in 10-gallon milk cans and deliver it steaming hot at 25 cents per can to any part of the house where the housewife wants it. Each can, when full, weighs 110 pounds. The power plant uses preheated softened water in its boilers, and this is the product which is sold the young



Saran rubber, one of Dow Chemical's superior developments in tank linings, has combined the physical properties of rubber with the chemical resistance of saran. This high degree of chemical and abrasive resistance makes saran rubber an outstanding lining where resistance to grease, solvents, acids and other chemicals is indicated.

Saran rubber can be applied easily, effectively and economically by experienced tank lining applicators located strategically throughout the country.

Get in touch with an applicator today by contacting your nearest Saran Lined Pipe Company office —and find out how you can preserve the life of costly equipment.

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Charleston, S. C. • Toronto

DOW

"hot water boys" for their unique distribution service.

At first this writer thought that the water would soon cool off, but he was assured that in those huge cans it remains steaming hot for 3 to 4 hours. Of course, the can could be insulated by using a milk can jacket, but that doesn't seem to be necessary.

The "big days" for the young veterans are, of course, Mondays and Tuesdays, those being wash days. Housewives buy more of their product in summer than they do in winter—for obvious reasons. The veterans state that in addition to use for clothes washing and bathing they have delivered hot water for scalding pigs, scalding chickens, for washing hair, for wading pools used by kiddies, and for tanks located on top of buildings used for showers.

So far as this writer has been able to learn, here is a business that is *really* new.—*W. F. Schaphorst.*

Ohio River Compact Commission News

In mid-summer, the Ohio River Compact Commission, held its annual meeting and elected Henry Ward as the new Chairman of the Commission. Mr. Ward represents the State of Kentucky on the Commission and is Commissioner of Conservation of that State. He has been active in the Kentucky State Legislature and for many years has worked for the abatement of pollution in his state as well as in the Ohio River Valley.

The Commission decided that civilian defense measures relating to sanitation and water supply in the eight-state area covered by the Compact will be coordinated through the engineering committee of the Commission. Plans were made to investigate brine pollution of the Muskingum River and to investigate the water quality of the Ohio River at points where it crosses state lines. This investigation is to be one of annual studies designed to provide a yardstick of pollution-abatement progress and to center attention on places where remedial measures are necessary.

The Wabash River study has been completed and is in the report stage. Studies also being completed on pollution of water supplies from breaks in oil lines.

A committe of the commission is drafting waste control measures to curb stream pollution and aid in conserving metal important to national defense. A manual of plant practice is being developed for electro-plating establishments with a view to curtailing wastes from plating processes.

FOR WATER SOFTENING . . . TURBIDITY AND COLOR REMOVAL
. . . INDUSTRIAL WASTE TREATMENT . . .

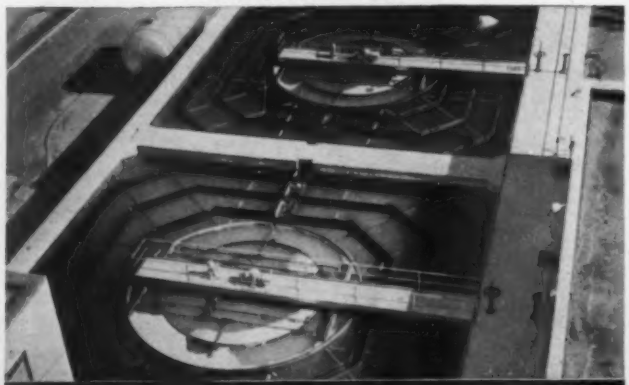
The Clariflow

with independently-operated mixing, flocculation, stilling and sedimentation zones

A notable improvement over conventional short-retention water treatment units. Provides individual functioning of mixing, flocculation, stilling and sedimentation zones. • Its control over short-circuiting, control over each function and control of sedimentation through low weir rates mean improved effluent . . . higher filtration rates . . . longer filter runs . . . better industrial waste recovery and treatment.

Write for Bulletin 656

Orlando, Florida Installation



WALKER PROCESS EQUIPMENT INC.
FACTORY • ENGINEERING OFFICES • LABORATORIES
518 HANKES AVENUE, AURORA, ILLINOIS
PROQUIP

MANUFACTURERS' and EQUIPMENT NEWS

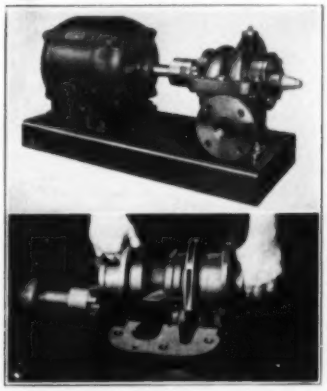
901

Pump Maintenance Service

De Laval Steam Turbine Co., Trenton, N. J., has just announced a new line of small standardized general service pumps with an exchange plan. In the new De Laval Type GS pump, all parts except the bare pump casing are contained in the

For further information on equipment mentioned on this page, mail a Reader Service Card with your name, address, and key number of the item.

rotor assembly. When maintenance is necessary, you simply remove the top cover and end plate studs, lift out the assembly and drop a new



one in place. New rotors are available for immediate shipment from factory stock. The old one is returned and full credit given for all serviceable parts or, the entire pump can be exchanged for a factory rebuilt and guaranteed pump, with full credit being allowed for serviceable parts.

National Technical Labs Now Beckman Instruments, Inc.

National Techanical Laboratories, manufacturers of Beckman pH Meters, Spectrophotometers, Automatic Titrators, etc., has announced that it has changed its corporate name to "Beckman Instruments, Inc." This action was taken for the purpose of associating the corporate name more closely with the trademark of its principal products.

No other changes are involved—either in company organization, policies, personnel, or products, or in the locations of its factory and services branches in New York, Chicago and South Pasadena, Calif.

902

Chemical Mixing

American Well Works, Aurora, Ill., has announced the development of the **"American" Homomix,** which is a rapid mix unit accomplishing instantaneous, violent, uniform blending of a liquid and one or more chemicals without the use of a mixing tank.

The Homomix is constructed of one or more mixing stages and forms

FRESH OUT OF AIR, SIR?

Call on *R-C dual-ability* to move air or gas in any quantities for industrial uses

When you have a job of handling gas or air, in quantities from 5 cfm to 100,000 cfm, Roots-Connersville will do it efficiently and economically. With many sizes and types, we can match blowers, exhausters and gas pumps closely to the job, to reduce first cost and operating costs.

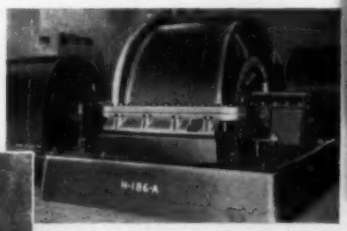
R-C *dual-ability* offers you the exclusive, *dual* choice between Centrifugal and Rotary Positive designs. You can select single-stage or multi-stage units, from our standard lines, with flexibility as to drives and other accessories to meet your needs.

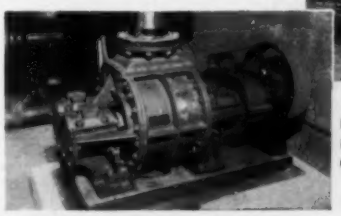
To aid in your specifications, our air-and-gas specialists are at your service. With nearly a century of experience behind them, they can help you solve almost any problem of handling air or gas.

ROOTS-CONNERSVILLE BLOWER CORPORATION
509 Mount Avenue, Connersville, Indiana

CENTRIFUGAL

Three Centrifugal Blowers in large eastern sewage treatment works. Capacity 15,000 cfm each.





Rotary Positive Blower used in water filtration application. Capacity 470 cfm.

ROTARY

ROOTS-CONNERSVILLE

BLOWER BUILDERS SINCE 1854

ONE OF THE DRESSER INDUSTRIES

For further information on equipment mentioned on this page, mail a Reader Service Card with your name, address, and key number of the item.

part of the influent piping. Each stage consists of a diffusing empeller rotating in a blending chamber, driven by a continuous shaft, direct-connected to the prime mover. Introduction of chemicals to each chamber is made through a tube specially adapted for handling the applied solution.

Rockwell Name Dixon Asst. V.P.

W. F. Rockwell, Jr., President of Rockwell Manufacturing Co., has announced the appointment of L. A. Dixon, Jr. as Assistant Vice President of the company's meter and valve division. He will assist in the coordination of sales and factory problems and make his headquarters at the company's home office in Pittsburgh.

For the past two years he has been the General Manager of the Pittsburgh-DuBois Division of Rockwell.

Brown Rejoins Bristol

R. M. Brown, formerly Sales Engineer with the Bristol Company of Canada, Ltd., and lately instrumentation engineer with Stadler Hurter & Co., Montreal, has rejoined the Bristol Co., according to announcement made by H. E. Beane, General Sales Manager. He will be stationed at Baltimore, Md.

SPARLING MAIN-LINE METERS

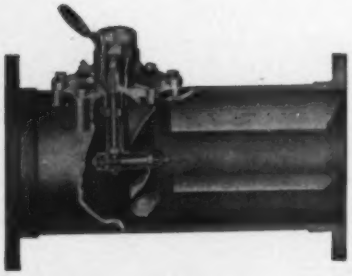
"ACCURATE Main-Line Measurement Pays"

And there is no simpler way to measure such flows than to mount a propeller within the pipe! The flow turns the propeller and this, through ball bearings and gears, advances the Totalizer.

Accurate? Each meter is individually tested and is guaranteed for accuracy within 2 per cent throughout the meter's rated range.

Over thirty years' experience goes into the making of the Sparling Meter you install!

Quotations and Bulletin 310 come at your request



Indicators and Recorders may be installed at any distance desired from the meter. Autometered chemical feed controls, too, may be added as required.

SPARLING METER COMPANY
INCORPORATED

LOS ANGELES 54....Box 3277 Terminal Annex
CHICAGO 8....1500 South Western Ave.
BOSTON 8....6 Beacon Street
626 Broadway....CINCINNATI 2
101 Park Avenue....NEW YORK 17
1932 First Avenue....SEATTLE 1
DALLAS 1....726 Reserve Loan Life Bldg.

903

Vertical Turbine Pump

Worthington Pump & Machinery Corp., Harrison, N. J., has developed a completely new line of Vertical Turbine Pumps with capacities from 50 to 15,000 gpm.

The new models develop maximum performance per size and overlapping coverage allows selection of a unit for nearly any capacity and head condition at peak efficiency. Incorporated in the line are extra size bearings of special materials for long life; shaft seals where required; enclosed impellers throughout; wearing rings; flanged and bolted bowl construction. Either oil or water lubricated pumps are available and both are arranged for motor drive, right angle gear drive, or belt drive.

New "Super" Supercharger

The largest capacity engine superchargers ever to be produced in this hemisphere have been announced by the Cooper-Bessemer Corp., and are being built at its plant in Mount Vernon, Ohio. The new superchargers are of such size and design as to handle the requirements of any gas or diesel engine from 1200 to 2500 hp., according to Ralph L. Boyer,

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Cooper-Bessemer V.P. and Chief Engineer.

Mr. Boyer explained that "Cooper-Bessemer's decision to manufacture engine superchargers results from its inability to secure superchargers of such large size in this country."

904

Rubber-Lined Valve

R-S Products Corp., Philadelphia, Pa., has put on the market valve "No. 737" that can be completely rubber lined. This valve was developed for resistance against erosion and abrasion in the control and tight shut-off of either slurries or dry pulverulent materials in air transport pipe lines. Sealed to the valve vane as well as the valve body the rubber provides long-wearing resistance to abrasives since it is not totally flexed or distorted. With angular seating vane for wedge type closure, the soft rubber is compressed around the periphery of the vane to give tight shut-off even around the shaft bosses.

Mathieson's Roy Aston to Cincinnati

Royden N. Aston, representing Mathieson Chemical Corp., Chlorite Division, has transferred his head-

quarters from Niagara Falls, New York, to Cincinnati, Ohio.

Mr. Aston's new business address is Mathieson Chemical Corporation, 334 Dixie Terminal Building, Cincinnati, Ohio.

R. D. Wood Host To AWWA Delegates

Thirty-eight delegates to the AWWA Philadelphia Convention went on a two hour tour of the Wood Company plant and observed some of the largest lathes and other power tools in the process of making hydrants, sand-spun pipe and gate valves. Following the tour, the group, made up mostly of superin-

Can you control cut-off level as close as this?

With Foxboro Recording Rotax Control of water tower altitude, level is automatically and consistently held within limits impossible with pressure switches. A typical municipal installation, for example, employs a tank 30 feet deep, 150 feet above the pump station. With an instrument chart range of 120 feet to 150 feet, the Foxboro Rotax Controller holds the cut-off level to within 6" at all times!

Foxboro Recording Rotax Controllers are set directly to desired cut-off and start-up points, without fussing around or having to measure levels in the tower. Both settings are always readily adjustable by the operator. There's no need for wiring between tower and station because all measurements are made at the pump. And the chart records are constant proof that proper levels were maintained during fires or other emergencies.

Write for Bulletin 184-6 for further information on this simple, more accurate and dependable control for your tower level. The Foxboro Company, 228 Neponset Ave., Foxboro, Mass., U.S.A.

This exclusive Rotax assembly assures positive, unfailing pump operation. Its proven design overcomes disadvantages of ordinary electric controls. Maintenance is virtually eliminated.

FOXBORO RECORDING · CONTROLLING · INDICATING INSTRUMENTS

For further information on equipment mentioned on this page, mail a Reader Service Card with your name, address, and key number of the item.

tendents and other waterworks officials, was entertained by the Wood Company at a luncheon at the Burlington County Country Club.

905

Ultra-Violet Sterilizer

Sepco Corp., Pottstown, Pa., has developed an entirely automatic, electrically-operated ultra-violet water sterilizer. Basically, the sterilizer consists of a stainless steel tank, inside of which are four specially-constructed ultra-violet ray tubes extending vertically through the water. Patented baffles at various levels guide the incoming water close to the constantly glowing tubes, thus assuring 100 percent purification. Designed to operate at low cost, the sterilizer needs no attention, uses no chemicals and no odor or taste is added to the water.

American Well Works N. Eng. Representative

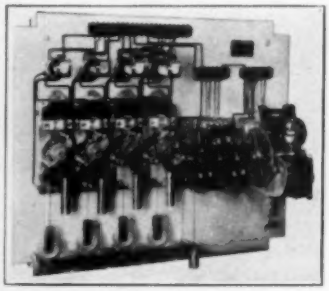
The American Well Works, Aurora, Ill., has appointed Mills Engineering Co., Inc., 10 High St., Boston, Mass., as their representatives for the states of Maine, New Hampshire, Vermont, Massachusetts and Rhode Island.

The Mills Engineering Co. has been in the Sales Engineering field for 23 years in Boston and New England. American Well Works, through Mills Engineering, is prepared to render service in connection with the company's line of processes and equipment.

906

Automatic Pump Control

Builders-Providence, Inc., Providence, R. I., has announced a new device for automatically controlling pump operation. Known as the "Pressureflo" Control, this new device was developed from the original invention of Marsden C. Smith, Chief Engineer, Dept. of Public Utilities, Richmond, Virginia.



The Builders "Pressureflo" Control consists of a flow-determining means, a pressure or level sensing device and a mechanism to translate this "information" into a control function. Other equipment consists of standard components plus a special control device to convert flow *and* pressure into pump response.

The "Presureflo" Control may be used to start and stop pumps, to increase or decrease the speed of one or more pumps, to maintain a predetermined pressure at any point or district on a distribution system, or to automatically adjust both pressure and flow to suit varying demands. These are but a few of the many possible applications in the pumping of water, sewage, oil or gas or the transmission of other liquids.

The pressure-flow system of control may be adapted to any distribution system, old or new, simple or complicated; no special design of pumping station is required and external control circuits are eliminated.

"PEERLESS PUMPS PREFERRED"

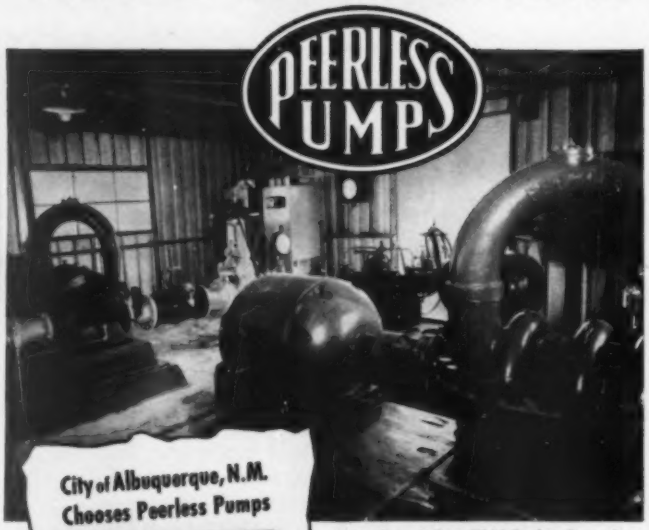


Photo shows 2 Type TU-14 Peerless Pumps installed for the City of Albuquerque, New Mexico . . . each pumping 325 gpm, at 578 Ft. T.D.H.

City of Albuquerque, N.M. Chooses Peerless Pumps

Read what Mr. Chas. Wells, City Manager, City of Albuquerque, says about Peerless Pumps:

"We buy all our equipment on the basis of evaluated performance, features of construction and necessarily from the best manufacturers in their respective fields. In the expansion of our water facilities necessitated by the phenomenal growth of our city, we needed much new pumping equipment. The Peerless pumps shown were selected for their excellent characteristics of performance and favorable evaluated bid price."

Signed: *Chas. Wells*
City Manager
City of Albuquerque, New Mexico

Follow the lead of hundreds of progressive communities who are standardizing on Peerless Pumps for all community water services, including water supply from deep wells, booster station service, cooling tower service and sewage and waste disposal service. Descriptive and illustrated bulletins are available on all types of Peerless Pumps. Plan with Peerless for all your needs for pumps.

Plan with Peerless for pumps for all these services:

Booster Recirculation Stations
Municipal Water Supply
Steam Plants
Cooling Tower Services
Sewage Disposal
Storm Water Disposal
Fire Protection
Flood Control

PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORP.
Factories: Los Angeles, California and Indianapolis, Indiana • *Offices:* New York; Atlanta; Fresno; Los Angeles; Chicago; St. Louis; Phoenix; Dallas, Plainview and Lubbock, Texas; Albuquerque, New Mexico.

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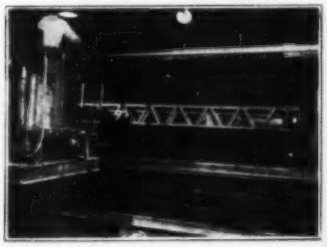
Lock-Joint Pipe Production

Shown in the accompanying photograph, the Lock Joint Pipe Co., East Orange, N. J., using Jones &



Laughlin oil tempered spring steel wire is making concrete pipe that can stretch. This wire wound helically under uniformly high tension around the outside of the steel cylinder puts the inside concrete core of Lock Joint Prestressed Concrete Cylinder Pipe in compression. This construction makes the pipe able to resist high bursting pressures, economized on the use of steel, reduces the weight of the pipe and gives it greater backload resistance. The J & L wire used in this operation has a tensile strength of 200,000 pounds psi.

Pontusco Buys United Concrete Pipe Corp.

H. L. Nelson, President of Pontusco Corp., has announced the purchase by Pontusco of the United Concrete Pipe Corp., of Baldwin Park, Calif.

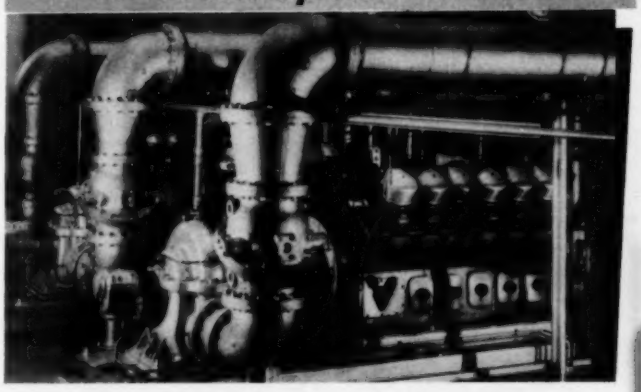
Facilities taken over by Pontusco include United's main office, a large permanent plant for the manufacture of concrete pressure pipe and extensive shop facilities for the manufacture of heavy specialized pipe making and handling equipment at Baldwin Park, Calif. Other pressure pipe plants of a permanent nature are located at Stockton, Calif., and Pleasant Grove, Utah. Other properties include seven plants in Calif. for the manufacture of low pressure concrete pipe for sewer, drain and irrigation service.

907

LaMotte Filtr-Ion

LaMotte Chemical Products Co., Baltimore, Md., has designed the LaMotte Filtr-Ion Unit to meet the pressing needs of those who require,

N.Y.C. selects Le Roi Engines for Water-System Modernization



3 Le Roi 600 HP engines provide 21,000 gpm standby capacity for 179th St. Pumping Station

Here's why New York City chose Le Roi L3460's to power the three 7000 GPM single-stage pumps in the pumping station which supplies water to the 100,000 residents of the Washington Heights area:

1. **Greater Power** — L3460 engines are the most powerful units of their kind — producing 600 HP maximum.
2. **Lower Cost** — these 600 HP gas engines cost only ¼ to ½ as much as diesel engines of equal power.
3. **Easy Operation** — L3460 engines operate on natural gas or gasoline. They're dependable, they start quickly, and warm up fast. That's why they are ideal for standby service.

Le Roi engines are available in sizes ranging from 6 to 600 hp — custom generator sets in sizes from 30 to 300 KW. Lighten the tax load in your community. Use dependable, low-cost Le Roi power. Send the coupon below for a detailed report of this and other money-saving installations.

LE ROI COMPANY

Milwaukee 14, Wisconsin

New York • Washington • Cleveland • Birmingham

Milwaukee • Tulsa • Dallas • San Francisco

Tear out this coupon and mail TODAY!

LE ROI COMPANY, Milwaukee 14, Wisconsin

Please send me complete information on the New York City Le Roi engine installation plus other cost-cutting job reports.

Name.....

Title.....

Address.....

City.....( ) State.....

E-66

from time to time, small amounts of chemically pure water, and in instances where elaborate types of equipment for such purposes would be costly and impractical.

These units involve the simple principle of passing the raw water through a bed of specially prepared and adjusted deionizing resin, thereby producing chemically pure water of the quality of triple distilled water, with a pH value of about 7.0. Each unit will deliver up to 10 gals. of chemically pure water (i.e., free from ionic solids), depending on the mineral content of the raw water supply.

They are made entirely of plastic, are inexpensive, entail no installation or operation costs and may be used continuously or intermittently, as desired.

908

Vibrating Screen

Productive Equipment Corp., Chicago, Ill., has developed a new, low cost vibrating screen. Called the Gyrette, it is a simply constructed positive action screen for efficient sizing, dry or wet and dewatering. Available in two models, base mounted and suspension mounted, and comes equipped with either 1, or 2, or 3 decks. The Gyrette can be adjusted to give 8 distinct stroke intensities by adjustment of a compound eccentric. Each adjustment provides a uniform gyrating circle-throw motion to the entire screening surface. Adjustment is quickly made without dismantling or use of special tools or parts. Easy cloth changes are provided for. Screen cloths in the fully-enclosed machines can be removed and installed by simply removing the front and rear plates, without disturbing the cover plates.

J. R. Sperry Heads Walker Process N. Y. Office

Walker Process Equipment Inc., Aurora, Ill., has announced the appointment of John R. Sperry, Vice President in charge of sales, as Eastern District Mgr. His headquarters will be in the newly opened Eastern

Office of the company at 30 Church St., New York City.

Mr. Sperry joined in the formation of Walker Process Equipment Inc. in 1946. He is a graduate chemical engineer with wide experience in the process field.

909

New Plastic Pipe

Carter Products Corp., Cleveland, Ohio, has announced the development and availability of a new pipe in the

"SIMPLICITY PAYS OFF doesn't it, Tom? These Buffalo-made American Meters are accurate after years of service".
AMERICAN (Bronze Case) WATER METERS
NIAGARA (Galv. Iron Case) WATER METERS
Simplicity of design of American Meters means fewer working parts to require servicing. These Meters continue to test excellently at slow flows over long periods of usage.
BUFFALO METER CO.
2909 MAIN STREET, BUFFALO 14, N. Y.

For further information on equipment mentioned on this page, mail a Reader Service Card with your name, address, and key number of the item.

Carlon line which features higher burst pressure and increased resistance to suction collapse.

Designated Carlon "EX" this plastic pipe features flexibility, light weight, and absolute resistance to rot, rust, and electrolytic corrosion. It is recommended for handling liquids intended for human consumption as well as for conveying industrial processing solutions, wastes, corrosive gases and vapors and use with suction pumps to transmit sludge or expel acid waters from mines.

Rapid, low-cost installation is possible because of its long lengths that can be curved to follow ditch, trench, or ground contour or to conform to structural plan. This flexibility, combined with long length, reduces number of fittings per installation to a minimum.

Dresser Opens New West Coast Warehouse

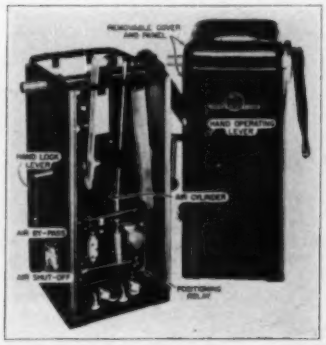
Dresser Manufacturing Div., Bradford, Pa., has announced the opening of a new West Coast warehouse on Aug. 1, 1950 to be located at 103 So. Bayshore Highway, South San Francisco, Calif.

The new warehouse will give improved delivery and sales service to the states of California, Oregon, Washington, Idaho, Nevada, Utah and Arizona, which comprise Dresser's Western District, now under the supervision of R. J. Driggs, District Manager. Paul McCullough, a seasoned veteran of 25 years' experience with Dresser at Bradford, is the warehouse manager.

910

"Characterized" Control Drive

Bailey Meter Co., Cleveland, Ohio, has just developed a characterized



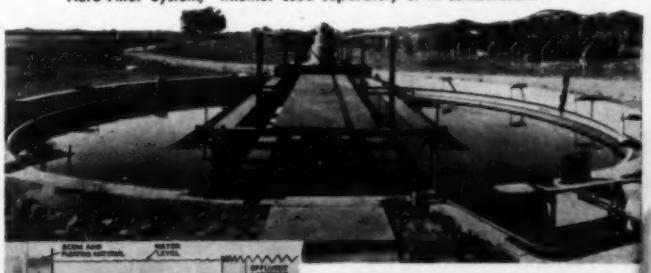
Establishing remarkable records for high purification at low cost—

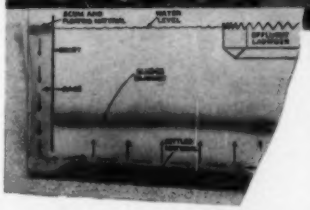
YEOMANS "SPIRAFLO" CLARIFIER and "AERO-FILTER"

SINGLY . . . OR IN COMBINATION

. . . especially in the treatment of strong industrial wastes

Low construction cost . . . low operating cost . . . high purifying efficiency: these are the characteristics of the Yeomans "Spiraflo" Clarifier and the "Aero-Filter System," whether used separately or in combination.





"SPIRAFLO" CLARIFIER—Unusual functional design makes this unit a highly efficient clarifier for use in trickling filter plants . . . eliminating several non-essentials that multiply construction and operating costs. Upward flow of influent through sludge blanket increases removal of settlable and suspended solids.

"AERO-FILTER SYSTEM"—Simplified design of this high capacity biological trickling filter cuts construction costs—reduces size of required filter bed by about 85%. High efficiency of single stage operation eliminates need of installing and operating expensive conventional recirculating equipment.

FIT ANY REQUIREMENTS—Overall plant efficiency is always higher when the two units are used in combination; however, plants using either type of equipment or the combination can be designed to fit any needs for treating domestic and industrial wastes.

IMPORTANT INFORMATION—Facts as to remarkable records established by Yeomans units will be helpful in your project planning. Bulletins containing performance data, field engineering data and construction cost estimates are available on request—use the coupon.

YEOMANS

YEOMANS BROTHERS COMPANY
1423 North Dayton Street
Chicago 22, Illinois

Please send these bulletins:
☐ No. 6570—"Aero-Filter"
☐ No. 6790 "Spiraflo" Clarifier

Name _____
Company _____
Address _____
City _____ State _____

For further information on equipment mentioned on this page, mail a Reader Service Card with your name, address, and key number of the item.

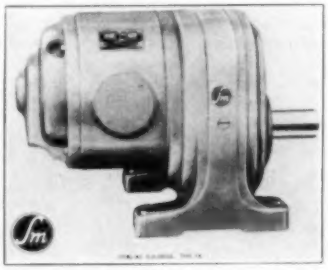
control drive which can be "tuned" to the requirements of a special application. This completely enclosed air-operated drive makes it possible to parallel characteristics of a driven device with characteristics of other equipment thereby securing a unified system.

The Bailey Control Drive, consists of a double acting air cylinder (with rigid supporting stand and enclosure), a positioning relay, and a manual operating wheel or lever. The positioning relay provides the drive's characterizing feature as it incorporates a cam whose shape determines the relation of control drive position to control loading pressure. Three cams are included with each drive and may be used interchangeably to obtain positions which are proportional to the first power (straight line), square, or square root of the control loading pressure.

911

Splash-Proof Motors

Sterling Electric Motors, Inc., Los Angeles, Calif., has announced that Slo-Speed Geared Electric Power Drives are now available in the "Splash-Proof" design for horizontal floor mounting, which is ideally suited for locations which are subject to direct streams of water or other liquids.



These motors are built with single or double reduction gears, providing speeds from 780 down to 20 rpm. in rating ½ to 15 hp. inclusive. The end bell design permits free passage of ventilating air through the motor and prevents splashing liquids reaching the interior of the motor. Seals are incorporated on shaft ends, assuring positive protection against entry of liquids into the bearing housings.

912

Sewage Pump

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has designed a new line of pumps especially designed for sewage handling.

The line (Type SW) follows the design of the company's solids-handling pump but has a special sewage type impeller with well rounded inlet edges and large fillets to minimize clogging. On the larger size pumps, a Francis type vane with rounded inlets is used for high efficiency. This vane is also used on smaller pumps in the line where maximum sphere size is of secondary importance, such as sewage sludge service. It is designed so that the entire rotating element can be removed readily without breaking pipe connections or moving the prime mover should it be necessary to dismantle the rotor.

913

Electric Submersible Pump

Sumo Pumps, Inc., Stamford, Conn., has just recently put on the market the electric Sumo Submersible Pumps, for domestic and industrial water supply systems. These pumps

NO "ICE" WORRIES

WITH

BUILDERS VISIBLE FLOW

Chlorinizers

Plants that use BUILDERS VISIBLE FLOW CHLORINIZERS are completely rid of chlorine "ice" difficulties. "Ice" in these chlorine gas feeders in no way affects their safe, accurate operation since vital control parts handle nothing but dry, inert gas. This means no bell jar heaters, no hot water piping, no water preheaters — and, best of all, it means simple, uniform operation at any and all seasons of the year.

Model DVS

Model CVS

BUILDERS CHLORINIZERS GIVE YOU THESE EXTRA FEATURES:

- no "ice" in vital control parts
- accurate Sightflo chlorine rate indicator
- visible and positive evidence of vacuum and flow
- long life chlorine control valve
- no tray-produced chlorine odors
- powerful, spring-loaded shut-off valve

For engineering information and Bulletins, address Builders-Providence, Inc. (Division of Builders Iron Foundry), 350 Harris Ave., Providence 1, R. I.

BUILDERS PRODUCTS

The Venturi Meter • Propelaflo and Orifice Meters • Kennison Nozzles • Venturi Filter Controllers and Gauges • Conveyoflo Meters • Type M and Flo-Watch Instruments • Wheeler Filter Bottoms • Master Controllers • Chlorinizers — Chlorine Gas Feeders • Filter Operating Tables • Manometers • Chronoflo Telemeters

BUILDERS PROVIDENCE Instruments

130 YEARS 1820 BUILDERS 1950 BUILDERS IRON FOUNDRY

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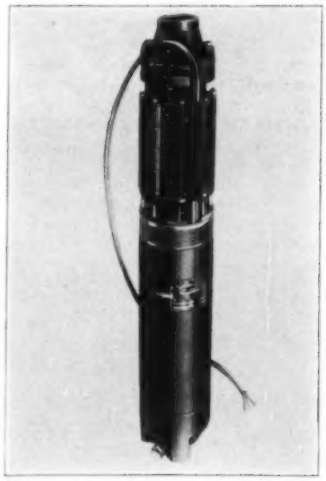
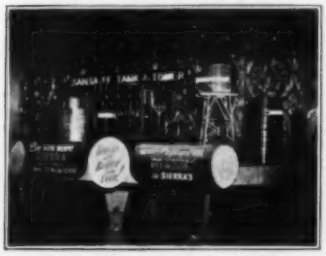


come in a wide range of sizes from 5 to 1250 gpm. Their simplicity and compactness permits use in narrow or crooked wells. Installation is quick and easy as the pump is merely suspended underwater by its own piping and the special submarine cable is connected to a convenient source of electrical supply.

Santa Fe Tank & Tower Tie-in Movie Promotion

Santa Fe Tank & Tower Co., was called upon by United Artist Productions for assistance in promoting its new feature film, "Sierra."



This unique tie-in occurred in the lobby of the United Artist Theatre in downtown Los Angeles where a display of industrial wood products manufactured by Santa Fe was on exhibition. The purpose, of course, was to illustrate the relative importance of Sierra Redwood and its ap-

"Don't blow your top . . . try HARDINGE CLARIFIERS!"

Hardinge Clarifier reclaiming blast furnace flue dust.

- In industrial areas, Hardinge Clarifiers have proven their worth in the treatment of industrial water supply. Also used in the recovery of valuable suspended solids from industrial waste water, they frequently leave the effluent clear enough for reuse in the process.
- Hardinge Clarifier systems are relieving stream pollution in many localities.
- Available with either steel or concrete tanks, Hardinge Circular Clarifiers are usually equipped with cut-flight scrapers which remove settled solids rapidly through a central discharge. Can be used in conjunction with chemical treatment and flocculation.

State your water treatment problem and write for Bulletin 35-C-15

Look for the Hardinge Exhibit in Booths 49 and 50 at the F.S.W.A. Convention, Washington, D.C., October 9-12.

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SAN FRANCISCO 11—24 California St. • 200 Bay St.—TORONTO 1

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plication to American industry and the movie "Sierra."

On display, are a variety of Santa Fe scale models of wood pipe, water storage tanks, and cooling towers . . . each fabricated from genuine Sierra Redwood. These models represent a segment of the industrial wood products manufactured by Santa Fe.

914

Test Tube Rack

Fisher Scientific Co., Pittsburgh, Pa., has developed a streamlined aluminum test tube rack to replace the old wooden type racks. Modernistic in design it consists simply of a single piece of heavy anodized aluminum sheeting, bent in the shape of a flat letter "S" and drilled with holes to accommodate up to six test tubes of 4 in. in height or more, and up to ⅞ in. in diameter.

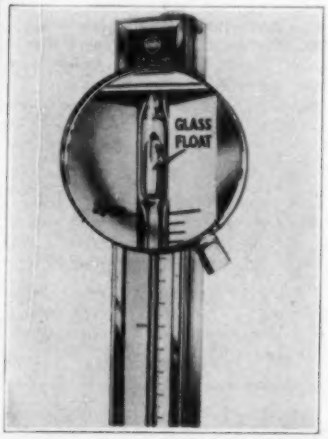
The corrosion-resistant metal construction will not crack, break, split, sag, swell or pull apart and can even be used in hot air ovens, autoclaves and other equipment where it may be subjected to unusual conditions of temperature, moisture or corrosion.

915

All-Glass Overflow Check Valves

King Engineering Corp., Ann Arbor, Mich., has announced the development of an all-glass overflow check valve to prevent loss of indicating gage or manometer liquid due to surge pressures.

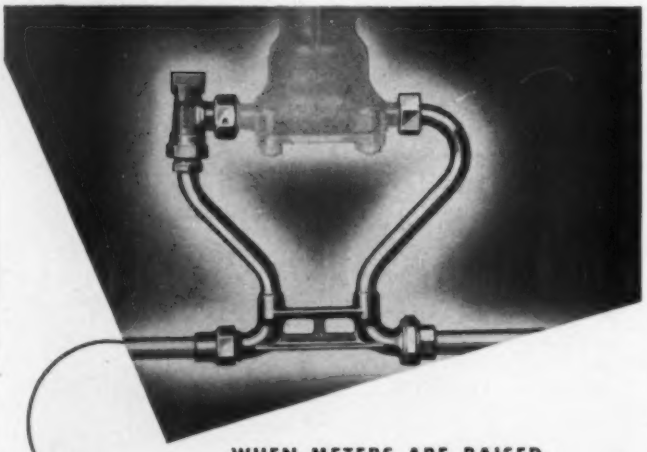
Known as the King Glass Tube Overflow Check Valve, this unit



consists of a glass float check in a glass cylinder. The cylinder has a seat at the top opening, and a glass tube below for connecting to the instrument. The mating surfaces of the float and cylinder are round and lapped to a perfect fit, and are so designed that the indicating liquid in the instrument will wet the seat and form a liquid seal. When excessive or surge pressures occur, the float rises instantly to form a perfect seal.

M. B. Skinner Expands

M. B. Skinner Co., South Bend, Ind., manufacturers of pipe repair clamps and saddles, has just broken ground for a plant addition that will



WHEN METERS ARE RAISED

FORD COPPERSETTERS

LOWER INSTALLATION COSTS

Ford Coppersetters save many fittings and much cutting and threading labor when meters are raised above service line levels.

Made in heights to raise meters from 6" to 36", styles to permit flexibility in spacing of bottom connections and special designs for unusual conditions.

All copper and bronze construction, maximum hydraulic efficiency, automatic electric bonding and many other money-saving features. Complete information in Catalog No. 50. Send for your copy today.

THE FORD METER BOX COMPANY, INC.

FOR BETTER WATER SERVICES

FORD

Wabash, Indiana

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The DRIVE
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Right Angle
GEAR DRIVE
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HEALTH PROTECTION . . . Dependable for continuous 24 hour constant service.

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DEPENDABILITY . . . High efficiency and all-weather service. Low operating cost.

WORLD WIDE ACCEPTANCE . . . In recognition of dependable service, economy of operation and maintenance. Hundreds now in use by municipalities.

INVESTIGATE NOW . . . Get the facts on the Johnson Right Angle Gear Drive. Send for illustrated catalog.

PHOTO: Type 3 — automatic dry pit municipal sewage installation at Stratford, Connecticut—electric motor or engine drive.

JOHNSON GEAR
AND MANUFACTURING CO.
"45 years of Engineering Service"
8th & Parker Streets • Berkeley 10, Calif.

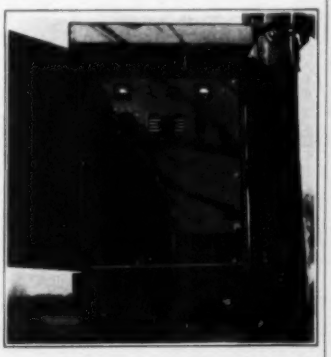
enable them to increase their production space by 50 percent.

Mr. P. D. Merrill, Vice-President, Production, stated that "This action is the result of constantly increasing sales over the past ten years and the fast acceptance of new items that have been added to the line since the war.

916

Cathodic Protection Rectifier

Control Corp. of Minneapolis, Minn., has just developed an "Application Designed" Rectifier and Control Assembly for use with Cathodic Corrosion Protection equipment. The Rectifier offers all weather corrosion prevention for piping systems buried in soil, submerged in liquid or above ground.



The features of this rectifier include fast, safe 8-step voltage adjustment possible without shutting down unit; high inherent inverse voltage protection—up to 36 volts assures trouble-free operation; removable re-enforced bug screens offer maximum bug protection with low cost maintenance; convection cooled rectifier elements have high thermal reserve, no moving parts; automatic high temperature thermostatic cut-out reduces output to half rated value during periods of excessive temperature, and recording

FREE
to WATER WORKS and SEWAGE MEN

HOW TO CONTROL ALGAE

"The Use of Copper Sulphate in Control of Microscopic Organisms" by Dr. Frank E. Hale (former Director of Laboratories, Dept. of Water Supply, City of New York) is an authoritative work concerning the control of micro-organisms and elimination of tastes and odors. Describes in detail methods of controlling various forms of microscopic life commonly encountered in water supply systems. Contains descriptive material, plus 49 photo-micrograph studies of organisms discussed.

ROOT AND FUNGUS CONTROL

"Copper Sulphate for Root and Fungus Control in Sanitary Sewers and Storm Drains," by John W. Hood, contains information published for the first time. This material includes actual methods for control and operating procedure. Here's the book that is a "must" for all sewage men.

GET EITHER OR BOTH OF THESE BOOKLETS ABSOLUTELY FREE— These two valuable booklets, so important to all water works and sewage men, are yours *without obligation.* Mail coupon below!

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WS-950

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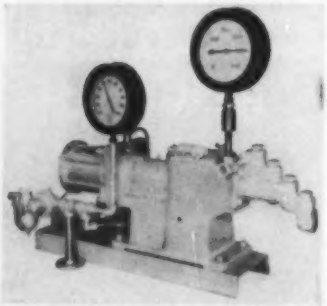
meter terminals for connecting recording meter into unit's D.C. circuit.

917

Hydraulic Test Pump



Milton Roy Co., Philadelphia, Pa., has developed the "aiROYmetric" hydraulic test pump that can be set to build up any desired hydraulic process pressure up to 25,000 psi. It will then maintain that pressure automatically by stroking as necessary to take care of any reoccurring pressure drop in the system.

The "aiROYmetric" hydrostatic test pump is a self-contained unit ready for immediate, automatic operation when an air supply is connected. The definite relationship between the areas of the air piston and pump plunger automatically balances the air pressure against the required hydraulic pressure. This pump is especially valuable for testing boilers, pressure vessels, pipe and piping systems, shell and other hollow forgings, vacuum pumps, vacuum valves, chambers and dryers, as well as for calibrating and testing pressure gages or for other hydrostatic test purposes, at pressures up to 25,000 psi.

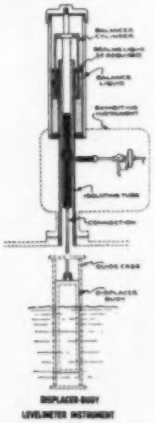
Organizational Changes at Hooker

Hooker Electrochemical Co., Niagara Falls, N.Y., has announced organizational changes involving four technical men. Joy E. Beanblossom has been made Manager of Development, James S. Sconce has been made Manager of Research and Dr. Bruno H. Woycik has been named as Assistant to the Technical Superintendent. In the sales development department, James S. Walker has been appointed as Supervisor of Technical Sales Service.

918

Displacer-Buoy Levelimeter

Fischer & Porter Co., Hatboro, Penna., has introduced a displacer-buoy Levelimeter instrument for measuring liquid-level changes greater than 5 inches. By suitably selecting dimensions and properties of the displacer-buoy components the total



(Continued on page 123A)

PIPE CLEANING TOOLS AROUND the WORLD
OSLO, NORWAY—SINGAPORE, M. P.

★ All this debris taken from 10" pipe. Section shows perfect job.
WATER LINES
★ "Flexible Power Bucket Machines, Power Drive Rods and Tools make work easier in the Orient too.
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147 Hillside Ter. Irving, N. J. 3786 Durango Ave. Los Angeles 34, Calif.
P. O. Box 165 Atlanta 709 House Bldg. Pittsburgh 22, Pa.
P. O. Box 465 Memphis, Tenn.
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WATER & SEWAGE WORKS READER SERVICE

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Please fill out a separate coupon for each item on which you desire information. This will greatly facilitate handling.

Key number is at head of each new product, item of equipment, catalog or bulletin, described in this issue.

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NOTE—

These cards are to be used only for items described in THIS ISSUE

WATER & SEWAGE WORKS

Will see that you receive information desired.

(Continued from page 122A)

liquid-level change, whatever it may be, is caused to produce a total buoy travel of 5 inches, thus matching the standard travel of F & P instrument transmitters.

An electric impedance bridge or a patented F & P magnabond magnetic transmitter can be used to transmit level readings to an exhibiting instrument. When operation will be at atmospheric pressure only and a direct connection into the instrument case from the liquid chamber is permissible, a direct mechanical connection may be made from the buoy to the exhibiting instrument mechanism.

Penn Instruments Appoints Keller Manager Sales-Engineering Dept.

Penn Industrial Instrument Corp., Philadelphia, Pa., has announced the appointment of George D. Keller as Manager, Sales-Engineering Department. Mr. Keller's experience includes 3 years in similar work with a prominent instrument manufacturer, four years of engineering and production work with the War Department and four years in the sales and engineering departments of Worthington Pump and Machinery Corp. Mr. Keller is a member of the I.S.A., ASME, and Harvard Engineering Society.

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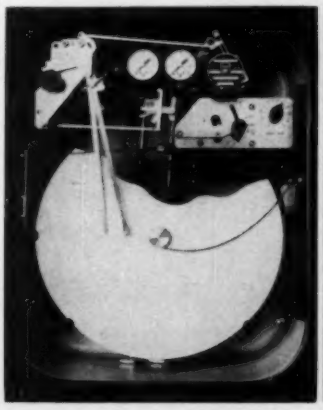
919 Air Operated Controller

Penn Industrial Instrument Corp., Philadelphia, Pa., has announced a new Air Operated Controller that is



the economical practical solution to costly
WATER HAMMER

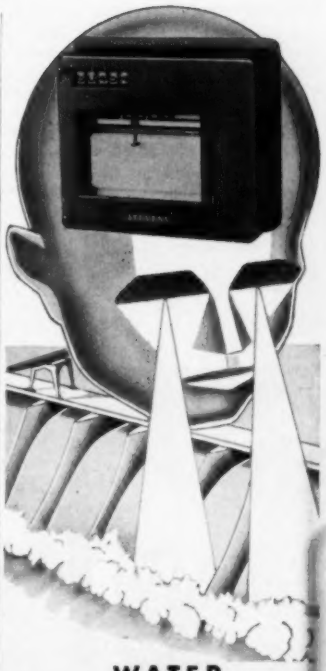
With its renewable disc and seat, non-wearing conical spring, the Williams-Hager Valve offers dependable protection in any position—horizontal, vertical with flow upward, vertical with flow downward and angular — Easily installed or reseated without special tools, it is available in standard pipe sizes from 1" to 20"

Write for Bulletin WH 100

THE WILLIAMS GAUGE CO.

Pump Valves . . . Water Gauges . . . Gauge Cocks . . . Steam Traps . . . Pump Governors . . . Feed Water Regulators . . . Water Columns

2000 PENNSYLVANIA AVE. • PITTSBURGH (33), PA.



WATER MEASUREMENT OR CONTROL

STEVENS

GRAPHIC, VISUAL OR AUDIBLE REGISTRATION

Whether you need a simple staff gage, float gage or complex remote operated recorder, there is a STEVENS instrument to meet your requirements. Water level or flow recorders for weekly service or long periods of unattended operation, direct float operated or remotely controlled; indicators, controls for alarms and pumps . . . the STEVENS line is complete in the field of water measurement and control. We also welcome inquiries concerning special problems.

Pioneers in the field of water level recording for more than 43 years, LEUPOLD AND STEVENS INSTRUMENTS, INC., have developed and perfected precision water measuring instruments of all types to meet a variety of specific needs, especially for water works, sewerage, irrigation and industrial uses.

Write for literature and information on accurate and dependable STEVENS water measuring instruments.

LEUPOLD AND STEVENS INSTRUMENTS, INC.
PORTLAND 13, ORE., U. S. A.

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sensitive, precise and fast in operation. Controllers can be supplied with any of the control functions generally required for process work: on-off, proportional control, automatic reset, and derivative action.

Some of the unusual features in the design of these controllers are: both nozzle and restriction have sapphire jewels to prevent wear due to dirt, water, or oil in the air; easy access from the front to permit cleaning while the controller is in service; easy removal of the relay separately or with the entire control mechanism by breaking only one tube connection and removing four screws. The same relay is used for all types of controllers so that control action can be easily and simply changed in the field.

920

Quick-Stop Motor

Standard Dayton Corp., Dayton, Ohio, has just developed a new a-c motor that is, fundamentally, an induction motor with a standard squirrel cage rotor. The stator, however, employs in addition to its running winding, a single phase a-c winding for electro-dynamic braking.

In operation, the motor is started as any other standard motor, but when it is to be stopped, the circuit to the running winding is disconnected, and a circuit is completed between the power source and the braking winding. This action makes it possible to shift gears, to turn by hand, or to position-stop since the braking force becomes negligible as the motor approaches a complete stop.

Bennett Penn Instr. Gen. Sales Mgr.

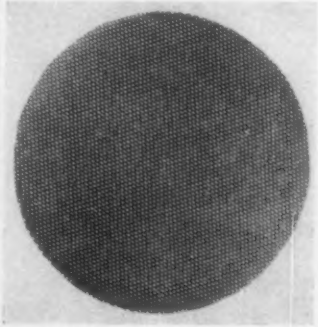
Penn Industrial Instrument Corp., Philadelphia, Pa., has announced the appointment of James W. Bennett as General Sales Manager. Mr. Bennett has devoted his entire business career to process and power plant instrumentation since he was graduated in 1939 from the University of Cincinnati.

For the past 5 years he has done special engineering sales work for Energy Control Co., of New York and Philadelphia.

921

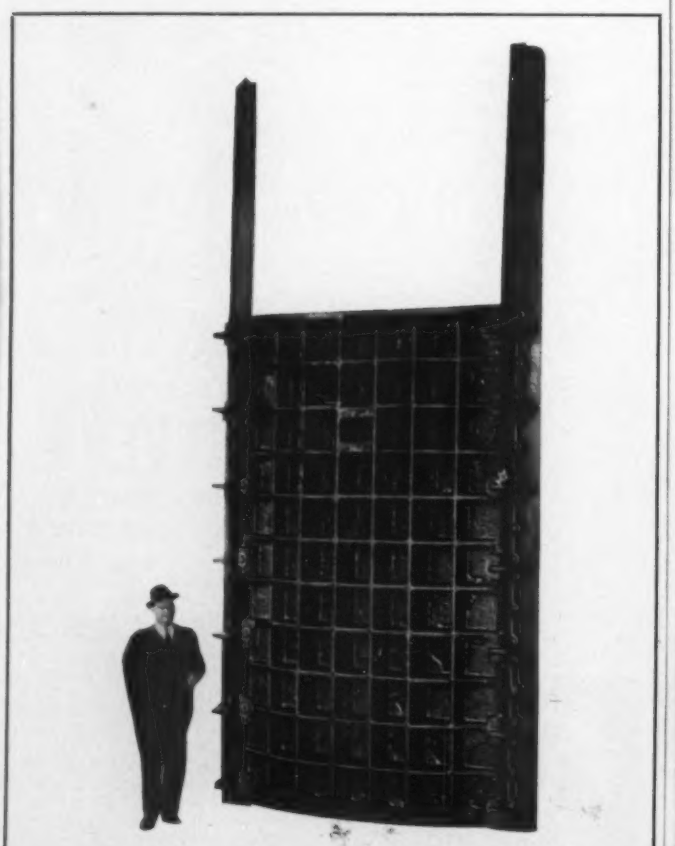
Filter Cloths

Filtration Fabrics Division, Filtration Engineers, Inc., Newark, N.J., has announced a new filter cloth called Feon Dynel, which is a chemical-resistant synthetic filter fabric made of spun-staple Vinyon-N that seals



easily and resists rim cutting when used on filter presses and similar filters.

Dynel fabrics possess superior resistance to alkalies, bacterial action, and a variety of organic solvents. Easy to clean, non-binding, they will last considerably longer than previously available cotton filter cloths.



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are built to stand long trouble free service. Amply proportioned for all stresses of shipment, erection and operation. They may be obtained with manual, hydraulic cylinder or motor operating controls.

THE FILER & STOWELL COMPANY
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LITERATURE AND CATALOGS

922
ROTATING EQUIPMENT MAINTENANCE

Allis-Chalmers, Milwaukee, Wis., has made available in booklet form a series of articles by Fraser Jeffrey entitled **"Care of AC Rotating Equipment."**

Contents of the 24 page booklet are broken down broadly into preventive maintenance and machine repairs. Under the former such subjects as drying moist insulation, measuring insulation resistance, bearing clearances and proper machine applications are covered. Machine repair includes data on stator coil and slip ring rotor repairs and balancing of rotating equipment.

923
INDUSTRIAL CONTROL DEVICES

Minneapolis-Honeywell Regulator Co., Industrial Div., has just published a catalog called **"Industrial Control Devices"** for temperature, flow, pressure, liquid level, and humidity. This catalog presents more than 100 different models of non-indicating electric, electronic, and pneumatic controllers that have innumerable uses in water and sewage works and industrial waste plants.

A number of important additions to the previous line are shown for the first time, including electronic temperature controllers, self-contained electric temperature controllers, and pneumatic insertion type temperature controllers; magnetic starters and contactors; heavy-duty pneumatic positioning motors; pneumatic automatic reset relays and electric step controllers.

924
VERTICAL TURBINE PUMP

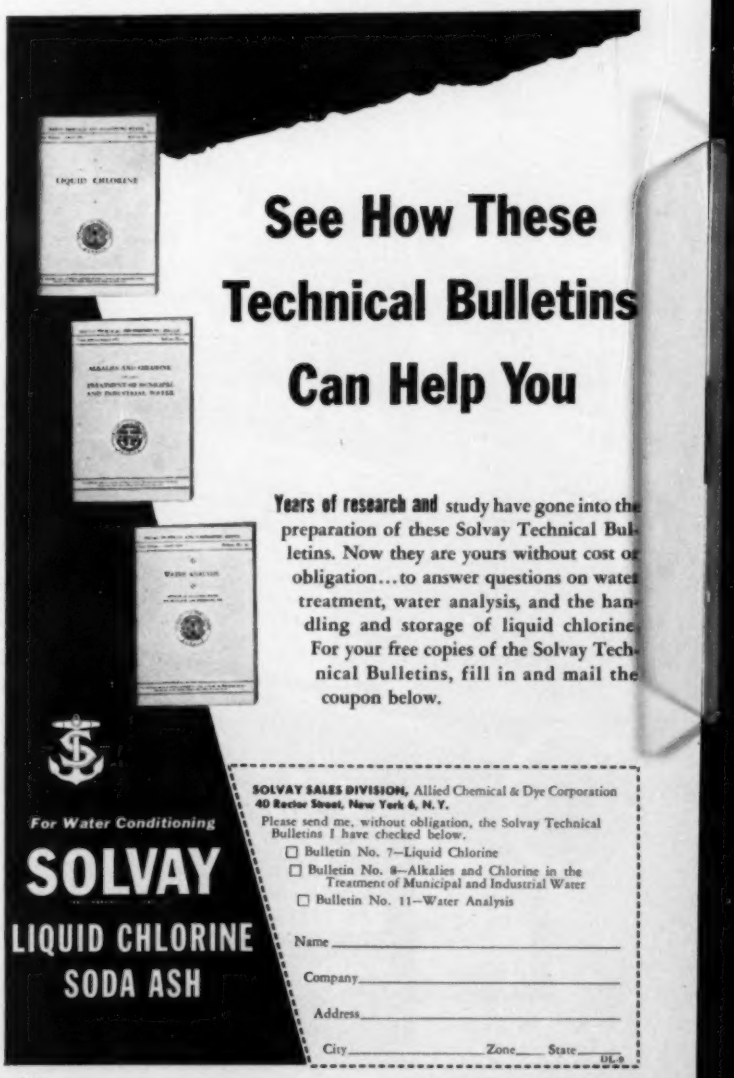
Worthington Pump and Machinery Corp., Harrison, N.J., has just issued a bulletin on the **Vertical Turbine Pumps Type Q.** This bulletin illustrates Type Q Vertical Turbine Pumps in sizes from 6 to 14 in. having capacities from 50 gpm to 3,000 gpm. Text includes special bowl design features, pump sizes and capacities and complete breakdown on standard specifications. The large size three color cross-section illustration of this oil lubricated pump shows and explains in detail all features of the pump.

925
NON-RETURN VALVES

Golden-Anderson Valve Specialty Co., Pittsburgh, Pa., has made available a bulletin on their **Triple Acting Non-Return Valves.** This bulletin discusses the functions of the triple acting valve, and the features of the valve such as the test arrangement that enables the operator to test the valves for automatic operation at any time without dismantling the valve and without his moving from the operating platform. Cross-section drawings show and list all parts of the three different body and yoke patterns available. Dimension tables and instructions are also included.

926
WEIGHTOMETER

Merrick Scale Mfg. Co., Passaic, N.J., has just published a bulletin covering the Applications of **Merrick Weightometer.** The bulletin, by means of line drawings and photographs, shows methods of installing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the Weightometer and how the integrator works. Clearance dimensions, recommended minimum number of idlers and data sheet complete the bulletin.

927

CONTROL VALVE

American Well Works, Aurora, Ill., has made available their latest technical supplement on **American Telescoping Sludge Control Valve.** This 4 page supplement explains the features of the valve along with explanatory line drawings and installation diagrams.

928

HYDRAULIC DRIVE PUMP

Hills-McCanna Co., Chicago, Ill., have just made available a bulletin on their **"K" Hydraulic Drive Pump for Metering and Proportioning.** This bulletin explains the design features incorporated in this pump with an explanation on the simple stroke adjustment. A large two color cross-section drawing shows complete operating details and typical construction of both a disc type and ball type twin check valve. On the back page are charts showing typical capacity and pressure ratings for the type "K" pump using 1, 2, or 3, hp. motors and lists information for both the single feed and two feed pumps.

929

ELEVATED STORAGE

Chicago Bridge & Iron Co., Chicago, Ill., in its latest issue of **The Water Tower** describes the use of elevated tanks designed to provide gravity pressure in the Decatur, Ala., Water system. A map of the town shows exact locations of the tanks in relation to the city and the filter plant. The present storage facilities consist of three tanks, 2,000,000, 1,000,000 and 300,000 gal. capacities.

Another interesting item is on the use of 25,000 gal. Waterspheres to maintain gravity pressure in the water systems at four of the five stations on the Ozark Pipe Line System, a 433 mi. 22 in. crude oil pipe line from Cushing, Okla., to Wood River, Ill.

930

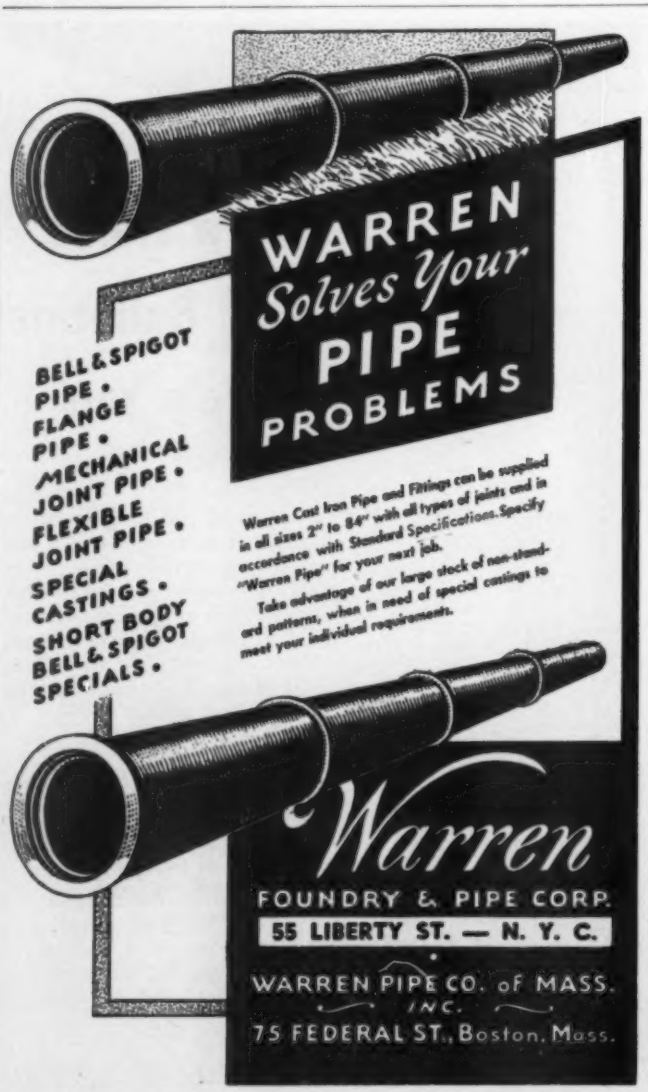
PROTECTIVE COATINGS

Atlas Mineral Products Co., Mertztown, Penn., has just released a bulletin on **Atlas Protective Coatings.** This bulletin, punched for inclusion in a three ring binder, discusses corrosion-proof coatings, Zerok, Ampvar, Atlastic, Koraloy and Alkaloy. Information is given as to type of coating, the corrosion resistance of the product, surface preparation, container sizes and colors. Charts are included to calculate the quantity needed to cover a given area.

931

SEWAGE TREATMENT FILM

The Minneapolis-St. Paul Sanitary District has available a film entitled **"A Tale of the Twin Cities".** This film is a 16 mm. sound film, which was produced in cooperation with the Visual Education Service of the University of Minnesota, is in color and has a running time of 21 minutes. There are several authentic river pollution scenes showing the Mississippi River in its worst condition. The story of how the citizens of two cities united to plan and build the largest plant in the world for the chemical treatment of sewage is told in the film. The present operation of the plant—the removal of the sludge solids, the huge incinerators, the return of effluent to the river in such condition so as to eliminate nuisances and harmful effects to fish life, are clearly shown.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Warren Cast Iron Pipe and Fittings can be supplied in all sizes 2" to 84" with all types of joints and in accordance with Standard Specifications. Specify "Warren Pipe" for your next job.
Take advantage of our large stock of non-standard patterns, when in need of special castings to meet your individual requirements.
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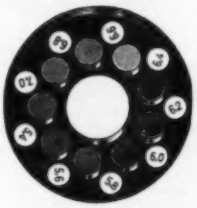
FOR PRECISE pH Control and WATER TESTS



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COLOR OF WATER
DISSOLVED OXYGEN
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Hellige Glass Color Standards are safely mounted in unbreakable plastic frames. They are more convenient and economical. They never fade or change. THEY NEVER FAIL.

WRITE FOR BULLETIN No. 602

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HEADQUARTERS FOR COLORIMETRIC APPARATUS

932

LUBRICATION TIPS

Alemite Division of Stewart-Warner Corp., Chicago, Ill., has just published a pocket-sized primer on industrial lubrication called **Eleven Ways to Cut Production Costs.** The booklet was designed "to aid maintenance men in bringing to the attention of management, suggestions for cost reductions through simplified lubrication methods from barrel-to-bearing."

Eleven examples of production or machinery expense economies, attained through modern handling and application of greases and oils, are presented in the booklet. Advantages over methods they are designed to improve are given in terms of lubricant savings, increased production use of machinery and elimination of labor costs or machine repair costs.

933

SEWAGE TREATMENT PLANT

Pittsburgh Equitable Meter Division of the Rockwell Manufacturing Co., Pittsburgh, Pa., in the latest issue of **The Pittsburgh Equitable Water Journal,** has a very interesting article on the Hyperion Treatment Plant in operation. The Hyperion Plant in Los Angeles will have the world's largest plant using activated sludge combined with sludge digestion, power generation and fertilizer production. The writeup is illustrated with photographs, shows the digestion tank system, pipe gallery, primary digester and receiving cyclones.

Another interesting item in this issue is the article on Mr. Rockwell's observations about Western European Water and Sewage Practices.

934

YOUR WATER PROBLEM

Hall Laboratories, Inc., Pittsburgh, Pa., have just published a new booklet, **"Let's Consider Your Whole Water Problem,"** which describes the industrial water engineering services offered in the fields of water procurement, treatment, usage and disposal by this firm. Organization of the Hall technical staff (comprising engineering specialists in water problems and in various processes in which water is employed, research and analytical units, and field service engineers) is described and diagrammed. Typical service problems are discussed with illustrations showing flow schemes of water in process and disposal.

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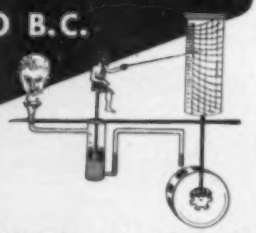
WATER at WORK

250 B.C.



A far cry from modern applications, this unique time piece known as the Water Clock of Ctesibius was operated by tears flowing from the eyes of a statue. The Pointer descended once in 24 hours, actuated by an automatic siphon.

for excellence in MODERN water treatment equipment—gravity and pressure filters—recirculation apparatus

MECHANICAL EQUIPMENT BY ROBERTS FILTER MFG. CO. DARBY, PENNA.

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935

MONOBED DEIONIZATION

Rohm & Haas Co., Resinous Products Division, Philadelphia, Pa., has published a 12 page booklet on their **Amberlite Monobed Deionization** process. This booklet contains a basic collection of valuable data on a new technique of ion exchange that has already proved to be a major advance in the technology of water conditioning. It covers the basic theory of monobed deionization and is complete with diagrams and formulas. Photographs illustrate the regeneration and the exhaustion steps along with a line drawing of the complete monobed unit design. The appendix contains the complete series of monobed resins showing the name and chemical behavior of the cation and anion exchange components along with a description of their typical uses.

936

RESEARCH BIBLIOGRAPHY

Arthur D. Little, Inc., Cambridge, Mass., has just made available their interesting booklet **Management of Industrial Research.** The booklet consists of carefully selected and annotated bibliography of books and articles of interest to executives concerned with industrial research administration. Prepared first to assist members of the Arthur D. Little staff review research policies and procedures it lists more than 80 different references dealing with administrative problems.

937

GATE VALVES

Rensselaer Valve Co., Troy, N. Y., has available a bulletin on their **Double Disc Gate Valves.** This attractive two color bulletin lists the advantages of this valve which is built in accordance with AWWA standard specifications. Cut-away and exploded views of the valves are shown with complete descriptions of all parts. Principal dimensions and directions for ordering are also included.

938

HOT PROCESS ZEOLITE

Cochrane Corp., Philadelphia, Pa., announces a new bulletin describing the new **Cochrane Hot Process Zeolite Water Conditioner.** The bulletin explains that the water conditioner works by a two-stage softener in which the first stage is the hot process, using lime or Dolomitic lime, and the second stage is a zeolite softener, which reduces the residual hardness

IT'S COMPLETE

TAYLOR WATER ANALYZER

There's the Value!

pH, COLOR, MANGANESE, TOTAL IRON, AMMONIA, CHLORINE, SILICA, NITRITE N, NITRATE N, FLUORIDE, COPPER

Complete enough for the largest water treatment plants—inexpensive enough for the smallest. Set includes a color standard slide for each determination—liquid color standards are enclosed within the slide, thus, eliminating inconvenient, fragile single standards—The Taylor Liquid Color Standards carry an unlimited guarantee against fading—your assurance of permanent accuracy.

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Write direct for this valued book "Modern pH, and Chlorine Control" . . . 96 pages of interest to water treatment engineers. Tells how Taylor sets are used throughout the industry. See your dealer for equipment.

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One Man Operation
On Every Application

HIGHLY EFFICIENT

IMMEDIATE SHIPMENT

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Pipe Line Equipment
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The Pioneer Self Caulking Material for C. I. Pipe

50 YEARS PROVE IT!

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ROTO-TROL

940

Write for Bulletin

THE 940 Roto-Trol will control your pumps, valves, alarm circuits, etc., all from one float. Each circuit is completely independent from all others, and may have several starting and stopping positions on both a rising and falling level. Can be set on the job. No special tools or experience required. All circuits, from two to ten or more, are made through snap action of mercury switches.

WATER LEVEL CONTROLS DIVISION OF

HEALY-RUFF COMPANY

783 Hampden Ave. St. Paul 4, Minn.

to zero. Also described are amounts of chemicals needed, installation requirements and investment required.

939

PIPE FITTINGS

Kennedy Valve Mfg. Co., Elmira, N.Y., has made available a new bulletin on **Kennedy Pipe Fittings,** which describes the complete line of cast iron, malleable and bronze fittings. This bulletin covers the recent additions to the line, of cast-iron screwed, flanged, sprinkler and extra-heavy malleable fittings.

940

CHLORINE CONTROL

Everson Manufacturing Co., Chicago, Ill., has issued a leaflet on **Sterelators** for the chlorination of water. The leaflet describes the complete function and operation of the Sterelator, which uses chlorine gas, and shows, by means of an attractive flow chart the functions of the control apparatus. Photographs show the different models and types. Complete mechanical and functional descriptions are included covering the controls, metering devices, control valve, solution introducers and safety features. On the back page are listed some of the water and sewage works that have installed Sterelators.

941

METALLIZED CORROSION PREVENTION

Metallizing Engineering Co., Inc., Long Island City, N.Y., has published a bulletin on the new **Metco Systems for Corrosion Prevention.** The bulletin describes how the Metco Systems provide pure zinc or aluminum coatings, properly treated to withstand various corrosive condition. Explanation is made of the advantages and typical applications and general recommendations are given. On the back page is a brief description of the more commonly used Metco Systems and their application to a particular atmospheric or immersion condition. Photographs show the surfaces before and after metalizing for actual applications. The bulletin explains that metalizing may be applied to any size structure, regardless of location and that any thickness of metal may be applied.

942

TEMPERATURE DIAGRAM FOR CHLORINE

Diamond Alkali Co., Cleveland, Ohio, has made available a diagram on **Enthalpy—Temperature Diagram**

CONTROL *Gas Pressures*

From Digestion Tanks with NORWALK REGULATORS and CHECK VALVES

Handling sewage gas from digestion tanks is one of Norwalk Valve's activities in the manufacture of gas pressure control equipment. Stock items include check valves, pressure relief valves, regulators, all sizes and pressures. Illustrated are the Norwalk Disc Check Valve and the "Meter Cop" (a Norwalk exclusive).

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NORWALK VALVE COMPANY

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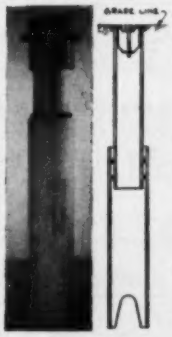

New Shock-Proof Curb Service and Valve Boxes

NEW FEATURE—the SHOCK-PROOF JOINT permits easy, accurate, hand-adjustment. Absorbs surface and road shocks. Asbestos cement pipe with cast iron top and cover. Lightweight, easily installed, corrosion proof. Available in range of standard sizes and styles. Write for detailed information.

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Local Agents for M&H Valve & Fittings Co. . . . James Jones Co. . . . Smith Blair, Inc. . . . American Pipe Co. . . . Hannah Foundry . . . Johns Manville, Hoose Connection Pipe.

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for Chlorine. The principal thermodynamic properties of chlorine are presented in convenient graph form, printed in two colors on heavy-coated stock and measuring 24 in. x 11 in., suitable for mounting or framing. The chart gives the heat content of the liquid, of saturated gas and of super-heated gas in the temperature range of —40° F. to 560° F., and in the pressure range of 15 to 100 psi., absolute.

The English system of units have been used and the data—expressed as Btu, psi., and temperature in degrees Fahrenheit—can be used directly without conversions.

A copy of this informative diagram may be obtained with a five-page reprint of an explanatory article giving helpful, detailed directions for use in the chart and the mathematical equations and formulas on which it is based.

943
PREVENTION OF LIME SCALE

Calgon, Inc., Pittsburgh, Pa., has just published a folder on the **Prevention of Lime Scale** deposition by "threshold treatment." The folder explains that Calgon, a vitreous sodium phosphate, is dissolved and the solution is added continuously to the water. Effective concentrations range from 1 to 10 parts per million. Typical applications of threshold treatment are cited, including prevention of lime scale deposition in boiler feed water lines, water heating, recirculating cooling systems and multiple-effect evaporators. After-precipitation following lime-soda softening is also prevented.

944
PERFORATED PIPE

Armco Drainage and Metal Products, Inc., Middletown, Ohio, has published a new 24 page illustrated booklet entitled **Armco Perforated Pipe** for Controlling Ground Water. It describes how harmful ground water can be controlled to provide stable roadbeds and dry subgrades, for airports, streets, recreational areas and industrial sites.

Pointing out that underground water conditions vary greatly, seven pages of diagrams show typical methods of treating sub-surface drainage problems.

Following a discussion of the primary advantages of perforated pipe —structural strength, resistance to impact, strong joints, controlled infiltration area and economical installation the booklet gives recommended installation methods.

945
CENTRIFUGAL PUMP CARE

Duriron Co., Inc., Dayton, Ohio, has made available a revised instruction booklet on the **Installation and Operation of Centrifugal Pumps** in corrosive service. While dealing specifically with Durcopumps, the information in the twelve varnished, smudge proof pages is applicable to all centrifugal pumps.

The booklet covers by text, cutaway diagrams and photographs, the proper location of, and foundations for pumps, correct alignment, priming, piping arrangements, adjustment of impellers, common troubles and how to overcome them. Friction data, formulas for figuring capacity, head and horsepower, and conversion data are also included.

946
CATERPILLAR DIESELS

Caterpillar Tractor Co., Peoria, Ill., has just recently released a booklet called **Pump Power** containing eight pages of testimonial facts and figures concerning irrigation, dredge, waterworks, repressuring, and water supply pumps driven by Caterpillar Diesel engines.

Irrigating for the rice fields of Cuba, channel dredging of the Pas-

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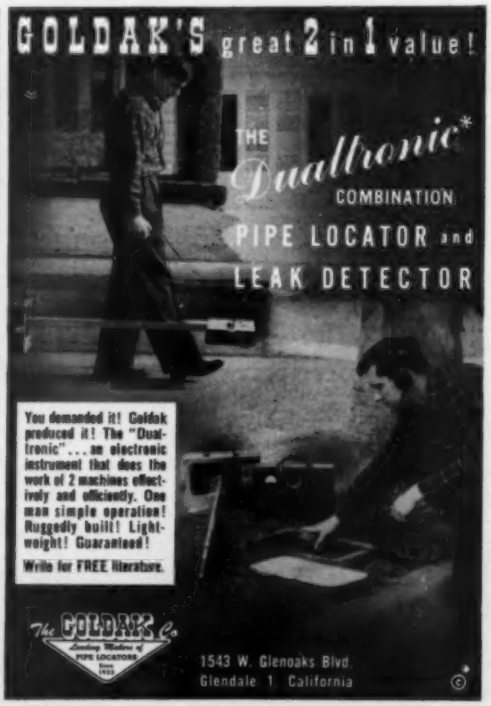
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You demanded it! Goldak produced it! The "Dualtronic"... an electronic instrument that does the work of 2 machines effectively and efficiently. One man simple operation! Ruggedly built! Lightweight! Guaranteed!
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saic River in New Jersey, turning the arid lands of Arizona and Texas into fertile growing land, and keeping Hialeah Race Course in Miami a beautiful track are only a few of the jobs done by "Caterpillar" engines and pictorially described in the publication.

One page devoted to the range of "Caterpillar" Diesel engines and electric sets is included, plus statistics concerning the horsepower and kilowatt output are given for each engine.

947

POLYVINYL CHLORIDE COATING

Carboline Co., St. Louis, Mo., has just released a data sheet on the new product **Polyclad.** This data sheet contains technical information on polyvinyl chloride protective coatings and emphasizes the fact that corrosion proofing is a process of using materials correctly as much as it is of using the correct materials.

Explaining a three coat system, it describes the correct procedure to test coating effectiveness and lists laboratory data correlating coating holidays, film thickness and corrosion resistance.

948

EXHIBITING & CONTROLLING INSTRUMENTS

Fischer & Porter Co., Hatboro, Penn., has published a complete new 28 page illustrated catalog describing new developments in **Exhibiting and Controlling Flow Instruments.** Discussed in the catalog are the basic Fischer & Porter devices for coupling a primary metering element to a secondary or exhibiting instrument and the "Magnabond" magnetic clutch and the electric impedance bridge transmitting systems.

The exhibiting instruments illustrated and described are: Flow indicators, recorders, integrators and a new pneumatic controller unit.

949

BLOWER

Standard Stoker Co., New York, N.Y., have just issued a bulletin on the **Standardaire Blower.** This technical bulletin has complete tables showing information for engineering layout, typical application data, design data, blower number and complete ratings CFM at listed RPM. Also shown are line drawings demonstrating the different dimensions including overall clearance, rotor lengths, shaft centers and adaptor plate.

"GUNITE" work by Cement Gun Co. makes Dam Better than New

The picture, above left, shows the advanced state of disintegration that existed when we were called in to repair a 50 year-old Gravity Dam. After we placed a solid "Gunite" blanket on the entire upstream side, seepage through the dam stopped completely. "Gunite" treatment on the down-stream side (above right) makes the dam stronger than when it was originally constructed. Throughout the operation, water was controlled so that the town's supply was not interfered with in any way.

Many instances of repair, remodeling and new construction with "Gunite" are described and pictured in Bulletin C2400. A request on your letterhead will bring your free copy by return mail.

CEMENT GUN COMPANY
"GUNITE" CONTRACTORS
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SEWAGE PLANT EXPANSION ... WITHOUT BOND ISSUE!

It's easy and economical to convert most overloaded sewage plants to the BIO-CHEMICAL PROCESS. Increase the capacity of existing activated sludge plants as much as 100% ... small conversion costs can be paid for out of operating savings.

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FOR SMALL GATES IT'S THE POWERENCH
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- *If you are interested in both subjects you get all the information in this one monthly magazine.*

950

PIPE CLEANER

Roto-Rooter Corp., Des Moines, Iowa, has issued a pamphlet on their **Roto-Rod** for municipal and industrial sewer drain and pipe cleaning work. This pamphlet, illustrated in detail, points out the features of the Roto-Rod machine with an explanation of how the Roto-Rod operates. Along with the machine are shown the different types of cutters available for specific or difficult cleaning jobs. Specifications and assembled overall dimensions are discussed on the back page.

951

GLASS PIPE

Fischer & Porter Co., Hatboro, Pa., have just published two new catalogs **"Glass Pipe and Fittings"** and **"Glo-Tech Precision — Bore Glass Specialties."** Glass Pipe and Fittings in ¼ in. through ¾ in. sizes are illustrated and described in the first catalog. Also included is complete information on a recently introduced metal-to-glass and glass-to-glass pipe coupling available in ¼ in. through 1 in. sizes, which replaces three-bold triangular metal flanges and other devices.

In the Glo-Tech Precision catalog precision-bore glass specialties are shown along with precision-bore round, square and capillary tubing for use in high-accuracy barometers and manometers, burettes, and other precision glass apparatus.

952

POLYPHASE MOTORS

A. O. Smith Corp., Los Angeles, Calif., has a new bulletin on **Polyphase Motors.** The bulletin describes one to 75 horsepower horizontal motors and gives construction details in cross section and cutaway views. Among the features described in the bulletin are motor appearance, insulation, bearings, ventilation, mounting, service, frames and end bells, terminal box, rotors and machining.

953

POWER EXHAUSTERS

The Gallaher Co., Omaha, Neb., have made available a booklet on the **Air-Van Power Exhausters.** This attractive booklet, done in two colors, explains the features of this air exhauster by means of a phantom drawing with descriptive text. There are drawings of many typical applications tracing the flow of air when exhausters are used. Included in the engineering data are recommended average air changes for many different types of installations, air velocities required for exhaust hoods, dimension table, rating table, material specifications, curb details, recommended installations for maximum quietness and typical specifications.

954

EMBRITTLEMENT

Allis-Chalmers, Water Conditioning Dept., Milwaukee, Wis., has released a new informational buletin on **Embrittlement—Current Status —Its Causes and Control.**

The bulletin tells how to distinguish between steam boiler cracks caused by corrosion-fatigue and embrittlement. It also explains the prevailing conditions that cause intercrystalline cracking of boiler metal, and describes recent developments including the use of nitrates as efficient embrittlement inhibitors and the use of the embrittlement detector unit.

Now you can machine TRANSITE PIPE on the job with PILOT MACHINING TOOL

Now a simplex coupling can be used at any point where pipe is cut. Save time in the field and utilize all odd lengths.

Duplicate factory machining in the field or shop on asbestos–cement pressure pipe with this specially engineered hand tool–for all pipe classes through 8" nominal (10" O. D.)

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CAST IRON PIPE

Any man can lay 100-year 2" mains with speed and ease by using McWane Oversize 2" THREADED Joint Cast Iron Pipe. All you do is "screw 'em together." A wrench is the only equipment needed.

Delivered in "EASY TO LAY" 18 ft. lengths

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Complete water purification and sewage plant equipment.

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a clear liquid penetrating (1"+) sealer for concrete and masonry preventing water absorption and reducing the action of acids. Holds 12' hydrostatic head. Use our Hayproc Rubberized Enamel for color on walls and floors—not affected by concentrated acids, alcohol, oil, or traffic abrasion.

30 OTHER PRODUCTS

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PALMER FILTER EQUIPMENT CO.

822 E. 8th St. Erie, Pa.

Engineers and Sales Agents

955

SURFACE CONDENSERS & AUXILIARIES

Worthington Pump & Machinery Corp., Harrison, N.J., announces the availability of a new bulletin pertaining to its **Surface Condensers and Auxiliaries.**

With chapters on Worthington Surface Condenser Design, methods of installing condenser tubes and construction on various types and sizes, this bulletin is well illustrated by cross section, photographs and drawings.

Also included are facts entering into the calculations determining the proper size of surface condenser and auxiliaries to best meet operating and economic conditions; as well as information on tubing characteristics, heat transfer curves and surface condenser friction curves.

956

SELF-PRIMING PUMP

Allis-Chalmers, Milwaukee, Wis., has issued a new eight page bulletin describing their improved self-priming centrifugal pump, which will not air bind or vapor lock.

The bulletin, complete with photographs and diagrams, illustrates the self-priming action and provides charts for pump selection according to the characteristics of the liquid to be pumped, the capacity in gpm. and the total head in feet. It also shows a motor frame table, size and type tables for both the close coupled and base mounted models.

The center spread of the bulletin shows an exploded view of both the pump and the motor with explanatory notes covering each part. Photographs of these pumps in typical installations are also shown.

957

KING-GAGE

King Engineering Corp., Ann Arbor, Mich., has just published a 12 page illustrated bulletin on **The King-Gage**—a hydrostatic instrument that directly shows the weight, volume or depth of liquids in storage or in process.

This bulletin explains how the King-Gage operates, and gives details on construction, calibration and accuracy, together with complete specifications on five standard sizes. In addition, it describes and illustrates typical applications of the King-Gage for weighing liquids in mixing and formulating, remote control of inventory, etc.

Phipps & Bird

LABORATORY MIXER

IS the important piece of equipment in the Modern Water Works Laboratory. Now being used by leaders in water works research. Many superintendents and chemists have been able to reduce their chemical costs by the control of chemical dosages with this mixer. Write for literature.

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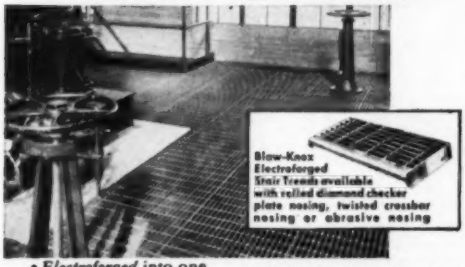

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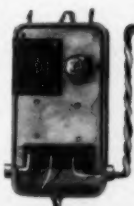

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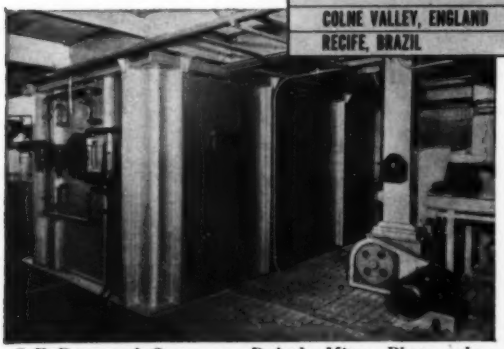

C-E Raymond System at Duluth, Minn. Photo taken from operating floor showing part of furnace.

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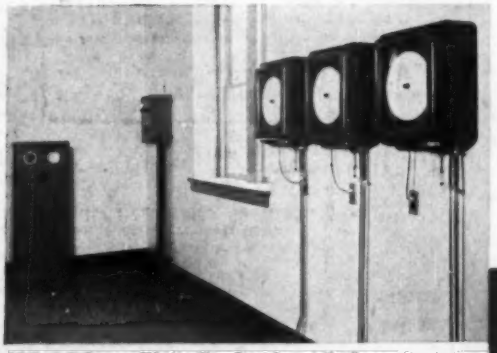

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